THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

JANUARY 2nd, 1841—JUNE 26th, 1841.

VOL. XXXIV.

"Theoretical and practical men will most effectually promote their mutual interests, not by affecting to despise each other, but by blending their efforts; and an essential service will be done to mechanical science, by endeavouring to make all the scattered rays they have separately thrown upon this region of human knowledge, converge to one point."—DR. OLINTHUS GREGORY.

LONDON;

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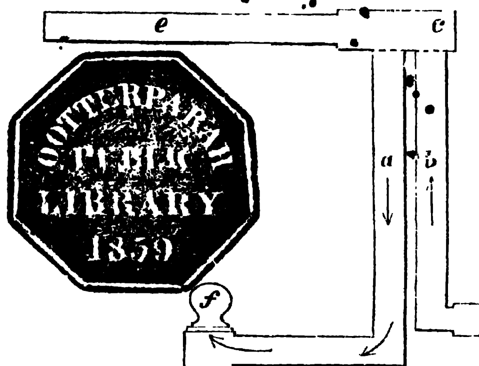
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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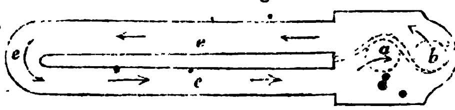
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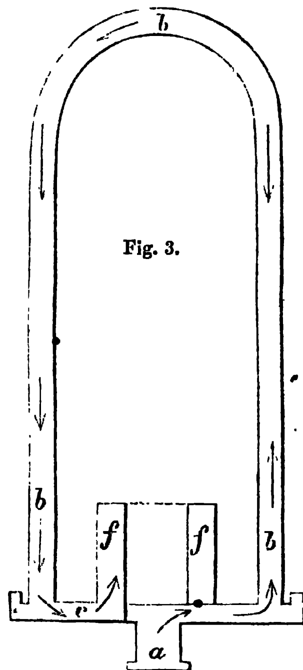
SMITH'S PATENT HOT GAS BURNERS.

Fig. 1.

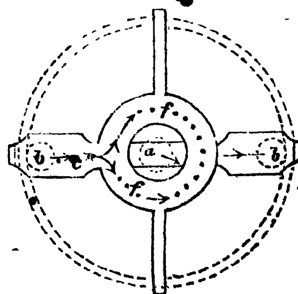


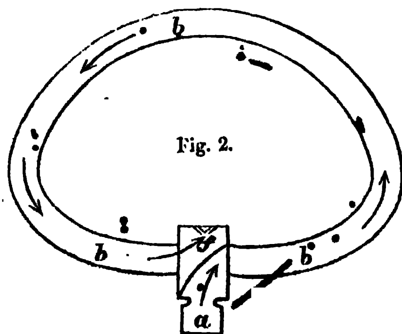
Plan of Fig. 1.





Plan of Fig. 3.





SMITH'S PATENT HOT GAS BURNERS.

The engravings on our front page represent a new method of consuming gas, which has been invented and patented by Mr. S. W. Smith, of Leamington. The invention consists in burning the gas in a highly heated state instead of cold, as in the ordinary method. It will be seen that this is accomplished in a very simple and efficient manner, by merely causing the tube conveying the gas to the burner to pass over the flame The saving produced by means of this improvement is stated to amount in different burners from 25 to 40 per cent. In the case of argand burners the flame is far more brilliant and much steadier—is quite free from glare and smoke—less moisture is given out during combustion—and the whole of the gas and its impurities are most effectually consumed. A peculiar advantage attending this invention is one that renders it valuable where a powerful and strong light is required; for with the patent hot gas argand burner, the supply of gas may be turned on till double the light of a common argand of the same size, is obtained, without the disagreeable and filthy nuisance of smoke, which not only renders everything in its vicinity black and unsightly, but damages to a serious extent valuable goods in the shops of jewellers and others, where bright and highly polished articles are necessarily exposed to its injurious influence.

The light from the patent *bat-wing* and other burners of this description, will be found more steady, clear, and brilliant, than in any common burner of the same size; while it appears from Mr. Cooper's Report, given below, that the increase of light from the same quantity of gas consumed is nearly 40 per cent. It would seem that a saving must of necessity arise in the use of the hot gas burners, for the expansion by heat of the gas within the tube, prevents the full or usual supply from passing through, and the quantity consumed will, therefore, be diminished in proportion as the heat of the gas is increased, while, at the same time, the light is improved.

In the ordinary burner a stream of cold vapour, or gas, is being constantly driven into the flame, which of necessity destroys both light and heat to a considerable extent (in the course of its own preparation to afford light again in its turn); this is again robbed as before, and so the process continues. In the patent burners the gas reaches the flame in a state ready to give light, or to combine at once with the atmospheric air—being in some cases *red hot*—so that the heat it would have to acquire before being serviceable, or ready to burn, is entirely saved.

When the gas possesses a superabundance of carbon, as that made from the coal in Scotland, in some parts of England, and in London, the patent burner will be found particularly advantageous; for it will be remarked that while the heat expands the *volume* of gas or proportion of hydrogen, the *quantity* of carbon remains the same, so that the proportions more nearly acquire a state, in which they are found to burn with the best and most economical effect, while at the same time the light is increased, and a saving effected with the same light, of from 20 *to* 40 *per cent.*

It appears that whatever burner is experimented upon, the saving is in all instances after the same ratio, and we do not doubt from the advantages thus offered, together with the low price at which the burners are sold, that they will be generally adopted.

Mr. Cooper's Report.

Sir,—Having now terminated a long series of experiments on your patent hot gas burner, I have the satisfaction of reporting, as under, the results which I have obtained in a condensed form, and which may be simply stated as follows:—

I find that when your patent form of apparatus is used with any argand burner, that the average increase of light from the consumption of the same quantity of gas, as ascertained by a great number of experiments, is in the ratio of 119 to 100, or an increase of nearly one-fifth; for with the gas which I employed, the consumption of 7½ feet per hour gave, when consumed by an argand burner of 16 holes, without your apparatus being attached, a light equal to 16¾ candles, and with the consumption of the same quantity, in the same time, and with the same burner, with your apparatus added, the light produced was equal to 20 candles.

Although I felt in a great measure satisfied with the results I had obtained, by this method of experimenting, yet I thought it desirable to vary the mode of operating, which I did in the following manner:—Having accurately adjusted two of Mr. Crosley's experimental meters, so that they registered

precisely the same, I selected two similar Dixon's burners, and attached one of them to one of the meters with your patent apparatus added, and the other to the other meter without your patent apparatus, and regulated the supply cock to each, so that they gave shadows of equal intensity. A considerable number of experiments were made in this way in order to obtain an average, the gas being supplied to both burners from a gas holder constructed to give equal and uniform pressures; the results were that the hot gas burner consumed 5·3 feet per hour, while the burner arranged in the common way for an equal intensity of light was consuming 6.43 feet, which is in the ratio 100:121.3.

In order to be certain that there was no difference to be attributed to any slight difference in the construction of the burners themselves, they were reversed, that is, the burner which had been used with the hot gas apparatus was applied to the ordinary mode of burning, and vice versa; the average results obtained, were, the hot gas burner consumed 5.6 feet per hour, and the other 6.65 feet per hour, which is in the ratio of 100:119.

Now in the first series of trials the ratios were as 100:121.3, and in the second as 100 119, the mean of which is, as 100.120, or an increase in illuminating intensity of 20 per cent.; which accords as near as can be expected with the first obtained results, and by methods so different, that I am induced to place the greatest reliance on their accuracy.

The difference of increase in illuminating intensity by the use of the hot gas apparatus, is however more remarkable when the common bat wing burner is employed; for I found that when two similar burners of this kind were substituted for the argands as in the former experiments, and being adjusted by their regulating cocks to produce equal intensities of light as determined by shadows, while that burner which was attached to the hot gas apparatus was consuming 4.36 feet per hour, the other which had not the advantage of the hot gas apparatus was burning 5.9 feet per hour; these as in the former cases being averages of a number of trials. The burners were then reversed as in the former experiments, and the results obtained were precisely the same; the ratios in these instances being as 100:135.3, or nearly 40 per cent.

I have therefore no hesitation in stating it to be my conviction from the results of the experiments which I have here detailed, that the employment of your patent hot gas burner will effect a saving to the amount above stated in the consumption of gas for the production of an equal intensity of illuminating power.

I am, Sir, your obedient servant,
JOHN THOMAS COOPER.

82, Blackfriars Road, October, 1840.

To r. MS. W. Smith, Leamington.

Description of the Engravings.

Figs. 1 and 2 are bat-wing burners, or any of that description. In fig. 1 the gas from the service pipe enters at *a*, where the burner is screwed on, and passes into the tube *b*, thence into the retort or bent tube *e*, and back through the tube *d* to the burner.

Fig. 2, is an arch or ring through which the gas passes in its way to the burner, and shortly becomes heated to an intense degree.

Fig. 3, is an argand. The gas enters at *a*, passing through the hollow bottom of the argand to the pipe *b*, which is carried over the flame and back again to the opposite side of the burner, into a hollow passage *c*, leading into the circular argand *f*—the arrows in all cases denoting the way the gas travels. The whole of the argand with glass holde is in one piece, and enclosed by this plan in the glass chimney.

AVERY'S ROTARY STEAM ENGINE.

Sir,—An accidental circumstance took me to Farn Acres, near Newcastle, and whilst there, I was told that a new rotary engine had recently been started about a quarter of a mile off. Feeling anxious to witness any novelty of this kind, I proceeded to the new iron works erected at Dunston by Mr. Porter, of London, and in the absence of the proprietor, was kindly permitted by Mr. Norval, the manager, to inspect the engine.

The first sight of the casing is very splendid: the circular portion, inclosing the arms, radiates very beautifully from the centre, and the pedestal on which it stands is a very elaborate casting, something like the base of some of the French china clocks. The whole of the outward part of the machine is got up in a very superior style, which a brass plate on one side announces by "S. Tate, Rotheram."

I was anxious to learn from Mr. Norval (whose name is familiar to many of your northern readers, as a man of great mechanical experience), the power of the engine, and the quantity of coal consumed. To these enquiries I could get no authentic answers, as the machine has only been about two months in operation, and an opportunity has not occurred of testing these particulars. In the short time I had to devote to the inspection, I ascertained the length of the arms from nipple to nipple to be 5 ft. 6 in.; dia-

meter of holes of ditto, $\frac{1}{16}$th of an inch; the steam pipe about $\frac{3}{8}$ths ditto, inside, and capable of being regulated in its supply of steam to the engine. The speed varies from 1500 to 2000, and the engine is even capable of making 3000 revolutions per minute. On the axle of the engine is a driving sheave 5 inches diameter, and 15 inches long, upon which a belt of that breadth runs.

The boiler is 15 feet long and 2 feet in diameter, and pressed to 80 lbs on the square inch. In it is 14 inches of water, which water is supplied from two circular heating cisterns, 15 feet long and 10 inches diameter. The cold water from the force pump is forced into the end of one, through which it circulates, and by a malleable iron pipe passes into the end of the next, through which it also passes, and from thence, by another pipe, flows into the boiler. These heaters are always *full* of water.

In the absence of positive information, I collected what I could as regarded the consumption of fuel, and from what I saw and heard, I think it is about 10 cwt. per day of 10 hours.

The boiler is set with the common flask flue. After the flame has left the boiler, it surrounds the heaters, and thence passes into the chimney.

The guaranteed power of this engine is said to be 10 horses, but the present work is merely the driving a fan blast 4 feet diameter, and 20 inches wide, making 900 revolutions per minute.

I furnish these particulars without offering any opinion, but merely as circumstances in which some of your readers may feel an interest. Mr. Norval intends shortly, fully to test its merits, and I am sure such a task cannot fall into abler hands. When this is done, I hope he will communicate to the public the result. I believe the present engine is on trial. Should opportunity occur, I may let you know further particulars, as I learn them. S.

CULTIVATION OF WASTE LANDS.

Sir,—To a person who has traversed every county of England and Wales, as well as the southern districts of Scotland, as I have, it cannot fail to be a matter of surprise, as well as mortification, to see the countless numbers of acres, which are lying in a wasteful, unproductive state, on the sides of the different turnpike roads, forming long narrow slips, often widening into really extensive tracts, frequently on both sides, where nothing is to be seen but stunted grass, muddy pools, or a bare gravelly or clayey surface; sometimes intermingled with thin spikey rushes, or a profusion of noxious weeds. Is it not a pity that such an immense quantity of soil, doomed as it has been from time immemorial to sterility and unprofitableness, should not be rendered conducive to some species of productiveness? From this mass of mismanagement and prodigal waste, I beg leave to exempt some portions of the county of Buckingham, through which I had occasion to pass about six years since, on a journey to Birmingham. It was with pleasure I saw, through a considerable line of that county, such portions of waste ground on the road side, pleasingly converted into cottagers gardens, and bearing in their inclosed spaces, a variety of the most useful articles of garden produce—the potatoe in particular, thereby enabling many a poor man to maintain a fat thriving pig or two, as a supply to his homely table. I am not sufficiently conversant in details of rural economy to know to whom generally such unappropriated portions of waste land belong, but I should suppose from the neglected and unnoticed state in which we invariably find them, that their most characteristic description would be, to say they form a portion of "*No Man's land.*"

Whilst I am upon this subject, I may as well mention that thousands and tens of thousands of acres, which are put down in the frequently erroneous "Parliamentary Reports," as waste lands of an entirely unproductive nature, are in too many instances either purposely or ignorantly so described. I remember at the time "The Signal Station" was established last war upon the summit of "Cefn Ogo," a bleak mountain on the coast of Denbighshire, North Wales, that on my brother, Captain, then Lieutenant B. Smith, who commanded that post, preparing to mark out a piece of ground for a garden, on its bleak north-bitten surface, the idea of any thing useful growing there, was by almost every person ridiculed. However he set his men to work with *Robinson Crusoe zeal*, and the result was that he was enabled to grow every useful article of garden produce! In the same manner

might thousands of acres now lying fallow, be reclaimed from barrenness in the mountain fastnesses of the Welch principality, but her gentry and other leading men, who ought to stimulate her agricultural and other useful interests, are nowhere to be found; and whilst Scotland, labouring under a more ungenial climate, is progressing in a manner that astonishes mankind, Wales may be compared to a portion of Asiatic Turkey, where the old routine of bygone times is invariably preferred to any more salutary modern improvements. Whilst Scotland again, has her scores of weekly and monthly journals, hurrying with teeming intellect from the press, the better portion who form the gentry and clergy of Wales (say of her twelve counties!) have not possessed sufficient spirit to maintain even the one only respectable attempt ever made in their periodical literature, by preventing the extinction of the "*Cambrian Quarterly Review*," now no more! Even *the Penny Periodical*, set on foot for the pupose of disseminating cheap literature in Wales, in imitation of the "*Penny Magazine*" established by Lord Brougham, is quietly lying at the bottom of the stream of Lethe, after a short effort to establish its vitality.

I remain, Sir,

Your obedient servant,

ENORT SMITH.

WARNE'S BOOT AND SHOEMAKER'S STANDING OR SITTING FRAME.

(Registered pursuant to Act of Parliament, Dec. 1st, 1840,)

Fig. 1.

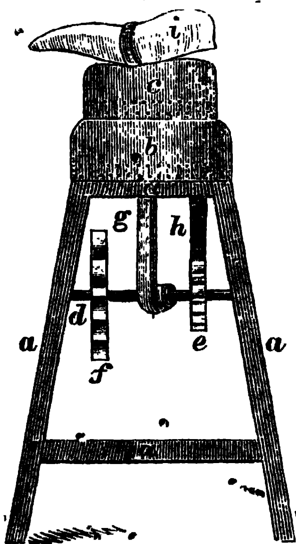
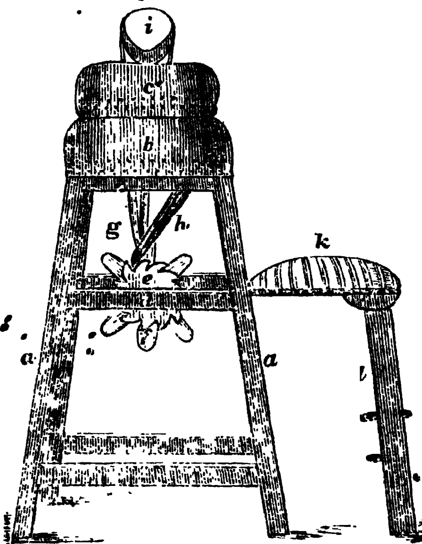


Fig. 2.



The serious injuries, both bodily and mental, which continually result from the stooping position usually occupied by shoemakers, while leaning over work placed on their knees, has often attracted attention, and some efforts to alleviate the sufferings thus occasioned have heretofore been made. The plan which promises to be most successful in effectually obviating this class of evils, is one which has been perfected by "one of the craft," and of which the above engravings will give a tolerably clear idea. The inventor, Mr. Warne, thoroughly understanding the peculiarities of the complaint, has supplied a very sufficient remedy, having contrived a simple and inexpensive apparatus, upon which all the manipulations of the shoemaker can be performed better than upon the knees of the workman, either in a sitting or a standing posture, with great facility.

In the above representations, fig. 1 is a side elevation, and fig. 2 an end view; *a a* is the frame surmounted by a hard

leather cushion *b*; *c* is a round leather cushion, revolving freely upon the former; *d* an axle carrying a hand-wheel *f* and a ratchet *e*; *g* is a strong leather looped strap, which passes up through the centre of both cushions for holding the work, and is fastened to and winds around the axle *d*; *h* is a pall taking into the ratchet-wheel *e*; *i* is a last upon which the work is placed; *k* a seat hinged to the frame and supported by the temporary moveable leg *l*.

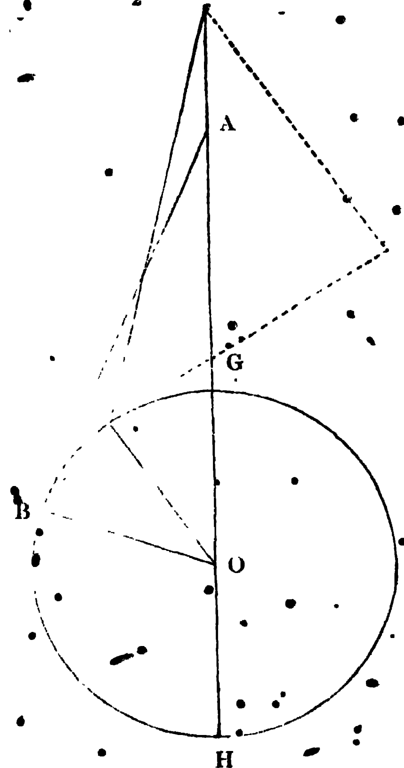
The work upon its proper last, being placed within the loop, upon the upper cushion, the wheel *f* is turned until the work is held sufficiently tight, being prevented from unwinding by the pall and ratchet. The work can be turned in all directions, but when it is to be shifted, the pall *h* is to be raised, when it is instantly set free. The inventor states that all the operations of sewing, stitching, hammering, steaking down the soles, nailing, healing, tipping and rasping, can be performed upon this machine with the greatest ease and expedition, and without the slightest injury to the work; the workman choosing that position from time to time which he finds most conducive to his personal comfort. The machine is said to be universally applicable to all kinds of work, from a man's heavy boot to a lady's satin slipper.

LONG AND SHORT CONNECTING RODS.

Sir,—As the subject of "long and short Connecting Rods" has lately given rise to some discussion in the scientific world, and I have seen in a late number of your valuable Magazine an article by Mr. Seaward upon this subject, I have taken the liberty of troubling you with the following remarks. It seems to me that the subject admits of a very simple explanation, which has not been given in the article referred to.

Suppose A G B to be a lever of the first order, G being the fulcrum; and suppose that at the end of one of the arms, any number of weights from *o* to P, be successively applied—the number of them being *n*; each weight being greater than the preceding one by a constant weight; then it is obvious that the mean of all these weights will be $\frac{P}{2}$, however great the number, *n*, may be, (P being supposed to remain constant.)

As a simple illustration, suppose $n =$ 7, and $P = 6$ lbs., then each weight will be greater by 1 lb than the preceding one;—the mean in this case would therefore be 3 lbs.; so that, if instead of applying 0, 1, 2, &c. to 6 lbs. successively to the end of the lever, we apply 3 lbs. 7 *times*, we shall obtain the same effect. Or, suppose further, that *n* is infinite, or that the power (increasing from zero,) was continually increasing, until it became P; then the corresponding effect would be obtained by a weight $\frac{P}{2}$ being *continually* applied.



This being premised, I have no doubt but the following will be easily understood:

Let *o* B represent the position of the crank when the effect of the given force, (which we will suppose acts in the vertical direction A *o*,) is greatest; and that the motion of B is towards G. Then it is evident that while the point B is moving from B to G, the effective

force is constantly diminishing until the point B arrives at G; when it is actually nothing. Therefore, agreeably to the above, it is most evident that the *equivalent* to the effective power, to turn the crank during its motion from B to G, will be truly defined by $\frac{P}{2}$, acting continually perpendicular to the crank. Similar reasoning will apply, while the point B is moving from B to H. So that the real force or power exerted by the connecting rod, (or more properly the power applied to it,) to turn the crank during a semi-revolution, will be

$$\frac{P}{2} + \frac{P}{2} = \frac{P}{2}.$$

We therefore conclude from this, that if instead of the power P, (acting as we have above supposed in the vertical direction A o,) a power $\frac{P}{2}$ had been applied, acting all along at right angles to the crank during its semi-revolution, the same effect would have been obtained. Now if the above observations be true, (and true they undoubtedly are,) it follows that whatever the length of the connecting rod may be, providing the tension upon it, when in a vertical position is the same, the effect produced will be the same.

It must, however, be understood that the length of the rod must be greater than twice the length of the crank; otherwise, it is evident, that a complete revolution cannot be obtained.

I trust, Mr. Editor, that I have, by an extremely easy method, proved that there is no power gained or lost by the use of long or short connecting rods, as has been asserted by a great many highly scientific gentlemen; and that it will be easily understood by the least inexperienced mechanic, who has the privilege of perusing your truly excellent publication. I might just add in conclusion, that the above proof might be obtained by a process purely mathematical, taking for a basis the parallelogram of forces, and summing the series when the number of terms become infinity; — meaning by this, the effective forces in different, though equi-distant positions of the arc B G. But as this method, I have no doubt, would have been rather too abstruse for the generality of your readers, I have chosen the method, which I here submit to your attention. Trusting you will oblige a humble correspondent by the insertion of this short letter,

I have the honour to be, Sir,

Yours respectfully,

C. WOOD.

December 22, 1840.

TEMPERATURE OF THE POLAR REGIONS.

Sir,—The proposition laid down by "E. A. M." in her theory of the universe, respecting the polar temperature, appears to me inconsistent with the very principle of that theory. We must consider the firmamental fluid as being entirely free and uninterrupted in its course; then, if in a state of positive heat, its main current of exhalation must be at the equator, whence it will spread expansively towards the poles south and north, but being in both directions supported by the exhalation of the same fluid, though decreasing as the latitude approximates to the poles, it will rise far above the atmosphere. Again, if in a state of positive cold, it will be drawn donwards by the absorption, and its main currents then will be from the poles and lessen as it comes nearer to the equator, passing freely intermingled with the other. Atomic and organic bodies will be the most affected by the sensation of cold at the poles, and by the sensation of heat at the equator. Now, a we regard life, vegetation, and chemical affinity, as the media by which the firmamental fluid passes from its state of positive cold to positive heat, the poles and the equator must be the most arid parts of the globe, the one being too cold and the other too hot. And this seems to be conformable to the knowledge we have of the apparent state of things. The gravity of bodies varying at different latitudes is a fact which might be assigned to the same cause. But this principle is not as yet sufficiently established now for me to adopt it, and I wish earnestly further explanation from "E. A. M."

R. C.

December 14, 1840.

SUPPLY OF WATER AT FIRES.

Sir,—The frequency of fires in the metropolis, the great devastation they

occasion, and the scarcely less frequent inadequate supply of water when they occur, will, I trust, be a sufficient apology for the liberty I am taking in addressing you on the subject.

This I do for the purpose of submitting, through the medium of your pages, a plan for the consideration of the public, which I humbly conceive would ensure a supply of water fully adequate to the greatest emergency. The plan I beg to propose is to construct tanks or sinks, each made of cast iron, of such dimensions and at such distances apart as might be considered advisable, in all the streets of the metropolis. The tanks in the same street, or on the same level, to be connected with each other by means of syphons at the top, or pipes at the bottom, whereby the water they contain would all flow into that which might happen to be nearest the fire; the water to be turned on from the main also as soon as possible in the event of fire happening —the tanks to be filled and replenished from the same source as often as it is turned on for private use—each one to be separately connected with the main and furnished with a waste pipe, by which means a portion of the water in them would be displaced as often as it was turned on, whereby it would be kept sweet, and any noxious exhalations avoided. I would recommend the opening down into the tanks to be large enough to admit the hose of at least four engines at the same time! Probably tanks of iron would be considered most desirable, and if they were cast about 6 feet square, and of the same depth, each would contain about 27 hogsheads, be of a manageable size, and two or more of them could be placed together; and by connecting them by means of syphons, the possibility of leakage of joints would be avoided. For the same reason I would recommend the different stations of tanks to be connected by syphons; in addition to which is the consideration that thereby a great amount of labour would be saved, as it would be unnecessary to go more than 2 feet deep with syphons, whereas pipes would require a depth of excavation four times as great.

Should the plan which I have taken the liberty to propose be considered too expensive for general adoption, it might possibly (if approved of) be carried into effect at the Bank of England, the two Houses of Parliament, the British Museum,* &c. Further details of the plan I should be happy to supply, but if the hint here thrown out should be considered worthy of being acted on, there are hundreds of persons as capable of carrying it out as, Sir,

Your obedient servant,

ALPHA.

P.S.—Considering that all the water in any number of tanks, if connected, would flow to that which might be supplying the engines, probably if they were but half the depth proposed they would be sufficiently capacious.

[There can be no doubt that considerable advantage would result from the adoption of some such plan as the preceding, which bears a striking resemblance to that of Mr. Baddeley, described in our 8th Volume, page 412, and which has been adopted in a few public situations. The expense, however, is the fatal objection; it is the business of that *nonentity*—"THE PUBLIC"—to provide such safeguards, but daily experience shows that "THE PUBLIC" care nothing about the matter. It is not possible to get the few salutary precautions which are made compulsory by Act of Parliament carried out; there is small hope, therefore, of any well organised system of protection being adopted. If the situation of the *fire-plugs* were indicated by the required marks, and the residence of the turncock was made conspicuous, there would be very few complaints of scarcity of water at fires; especially if adequate rewards were given that functionary for promptitude and attention in the discharge of his important duties.—ED. M. M.]

CONDENSATION—MR. SYMINGTON IN REPLY TO MR. HOWARD.

Sir,—Mr. Howard, in his communication contained in your journal of the 12th inst., asserts, among other inconsistencies, that he never tendered me an apology for a hasty assertion. Mr. Howard's memory seems to have failed him, for in vol. xxv, p. 362, of your Magazine it will be found that he says, "In reply to Mr. Symington's communication, I must freely *tender my apology*."

Mr. Howard is evidently a stone-throwing gentleman, for it seems that he cannot even

* The British Museum is adequately provided with water tanks.—ED. M. M.

have a peep at truth but by shying or "dropping" pebbles into a well. The discovery of truth, therefore, is not like his plan, principle, process, or method of condensation—the same whether practised in a well or garret.

Mr. Howard asserts that the *Dragon* is entitled to the palm of economy, inasmuch as it effects a saving in *speed*. Now Mr. H. has boasted of the *Vesta* being perfect, and yet the *Dragon*, which is only a tow-boat, has, since that boast was made, more than once given her the go-by.

Mr. Howard asserts that I affirm a saving of one-third of the fuel was effected in the *City of Londonderry*. This is an assertion which I most pointedly deny, and call upon Mr. Howard to produce his authority.

Mr. Howard asks, what is the truth with respect to the *City of Londonderry?* and answers his own question in a manner that shows his pebble-throwing has caused another face than that of honest truth to present itself to his prejudiced optics.

He says, "on applying to the Peninsular Company on the infringement of my patent, I communicated with one of the leading directors, a gentleman whose character is above suspicion, and well versed in matters relating to steam navigation, and he informed me, that the exterior pipe of Mr. Symington, when used *alone*, reduced the speed of the engines to 12 strokes per minute, or about one half; that he was of opinion that it retarded the vessel's way nearly a mile an hour, from its position; and further, that Mr. Symington proposed to divide the large pipe into many smaller ones, if the Company proceeded with the work, (being a still closer approximation to the practical carrying out of my invention), but which he *assured* me should not, under the circumstances, be permitted. He further and *fairly* stated that the application gave indications of advantage, so far as could be ascertained by such imperfect means."

In reply to all this, I have merely to say, that one of the leading directors, Richard Bourne, Esq., informed me in the presence of a friend, that he considered it a valuable invention, by which the boilers had been much benefitted; that he had an opinion, but that it was only an opinion, that external pipes might diminish the vessel's speed, and endeavoured, by means of a poker, to illustrate his theory, which, however to me, seemed founded in error. On inquiring how long it was thought the vessel would be laid up for the purposed alterations, he told me from ten to twelve months. On representing the injury the delay would do to the invention, and the unfairness of not allowing the apparatus to be tried—even if *The Londonderry* improved in speed, by having more powerful machinery,—and receiving no satisfactory answer, I deemed it proper, while I had the opportunity, of ascertaining whether her speed would be improved by the removal of the pipes, to do so, and therefore insisted they should be taken off,—a determination which was endeavoured to be evaded by means not such as I ought to have expected, considering the readiness with which I had met the views of her proprietors on all occasions.

The result of my experiment was much more satisfactory to myself than to the Company, as she had to return to England without being able to complete her voyage; and when she again attempted to complete it, she lost so much time, that serious apprehensions were publicly expressed for her safety, and on her return she was turned out of the Post Office service. How does this accord with the apparatus lessening the vessel's way? Or upon what principle, process, or method of reasoning, is Mr. Howard prepared to prove that increasing speed, is retarding progress? Or how could his informant arrive at the belief that "The Londonderry" had lost a mile an hour in speed, seeing she never had been tried without the apparatus, from the time she had been lengthened 25 feet in Messrs. Fletcher and Fearnall's dock, Limehouse, until it was removed, and she could *not* keep her time? One thing more on that point, and I have done with it. Mr. Howard has been told again and again that I never said the apparatus, as fitted to "The City of Londonderry," was perfect; so that if the strokes of the engines had been still further reduced, I should have considered it nothing surprising. But he, most ungenerously, to say the least of it, endeavours to keep out of sight, that with the addition of a small portion of outside water, the boilers were kept perfectly clean, which had never been the case before the usual number of strokes of the engines was obtained, and the vessel able to make good her voyages. The admissions made by Mr. Howard's nameless director, that the invention gave indications of advantage, so far as could be ascertained by such imperfect means, speaks volumes in its favour.

But as I deal not in secrecy, being prepared fully to make good what I advance, I may just inform Mr. Howard that Mr. Smith, another of the managers of the Company, spoke in the highest terms of the invention, and told several of my friends that he did not believe "The Londonderry" could make her voyage without it. The captain also was so much of that opinion, that, fearing it was intended to remove the apparatus, he took the engineer aside, and told him he must contrive to keep the vessel at Gravesend, to prevent such removal. There are a few other particulars which I could furnish, but

these may suffice to give Mr. Howard an opportunity of supplying me, through the pages of your journal, with the name of his skilful informant, who, I am certain, can neither be Mr. Bourne nor Mr. Smith.

Having thus replied to Mr. Howard, much more gently than from the tone of his letters he deserves, I take my leave of him with the assurance, that I have no objections to his making any experiments with the patent laws which he may deem likely to bring them to perfection.

I remain, Sir, your most obedient servant,
WM. SYMINGTON.

Wangye House, Essex, Dec. 21, 1840.

SCREW-PROPELLERS v. PADDLE-WHEELS.

Sir,—However disinclined I may be to trouble you again with further observations upon the merits or demerits of the application of the screw made by Mr Smith to propelling purposes, I cannot refrain from transmitting you the following remarks, and requesting the favour of the admission of them into your valuable pages; being in some measure moved to make this request, in consequence of the communication of Mr. Roger Phillips inserted in your last (905th) number.

If any thing, Sir, were wanting to show to unprejudiced parties the sensitiveness that Mr. Phillips unwittingly exhibits of the untenableness of his theory, it could not fail of being supplied by the free use this gentleman makes of assertion instead of argument—in the readiness with which he applies epithets in place of reasoning—and in the eagerness with which he grasps at his own loose misreadings of my remarks, for the purpose of proving me in error. Because, in my last communication, I said that I thought that "sufficient has now been said both for and against this screw-propeller, and the result may, I imagine, be safely left with time," he attributes to me the unfairness of being desirous of preventing him from enjoying the same number of opportunities for stating his opinions which I desire for my own remarks. In imputing to me a wish for such an extra advantage, he entirely overlooks the circumstance that my original article was itself *only a reply*, and this to a pamphlet not alone confined to your certainly numerous readers, but to the public at large. He also forgets the advantages he and his co-advocates of the screw have had in the hundreds of occasions on which the screw-propeller has been supported by articles in other branches of the public press, and also disregards the almost solitary ones on which the good qualities of this propeller have been impugned.

Without stopping to disclaim an unfairness which I never possessed, I will observe that Mr. Phillips might have saved himself the trouble of making this charge, had he had more knowledge of the impartial manner in which your periodical is conducted; and he might very safely have left with me the advantage which he so readily charges me with desiring to appropriate to myself, had he rightly estimated the capacity of your readers for the proper appreciation of an argument. Truth to say, I should have but a very low opinion of the mental qualities of your subscribers, if I supposed that they, having the whole of an argument in print before their eyes, must of necessity give judgment in favour of whatever opinions might happen to be heard last in order, without attaching weight to arguments previously urged. If I were inclined to retort, I should say that Mr. P. and other advocates of the screw having been so much accustomed to the good opinions of the public press, seem rather inclined to confine to themselves the use of that organ, and thereby to merit the charge of unfairness more than I do.

From the character of Mr. P.'s remarks, it must appear very plainly, that while he is very ready in making charges of errors, blunders, mistakes, and mis-statements, he does not exactly take the very clearest mode of proving the commission of these acts; and I think, considering the checks to his volunteered corrections of my statements, which he has already received and admitted, that a little more caution, in making his charges, would better become an argumentative disputant. Errors, blunders, and mistakes have not yet been proved by Mr. Phillips to have been committed by me; for, Sir, I do not admit a difference of opinion with this gentleman to be synonymous with these; and no mis-statements have I made. In all the results at which I arrived, I showed the process and figures by which they were obtained.

In his last communication, Mr. P., in order to prove that my theory is unsupported by the deductions of science, has so mystified his meaning, that, with the degree of consideration which I have given to his remarks, I freely confess I am unable to understand exactly what he means, or, if I do comprehend his meaning, then I have just exactly made that application of the deductions of science which he says I ought to have, but have not, done. The *surface* and *base* of which Mr. P. speaks, and which he imagines to be very different from each other, because at first sight they appear so, may perhaps, upon an elementary examination, prove to be exactly one and the same.

In proof of the incorrectness of my theory

of the action of the screw upon the steerage of the ship, Mr. P. urges that the excess of the underneath lateral resistance over the upper lateral resistance, being always resolvable into a force tending to give to the ship a permanent inclination from a straight course, and this deviation having been proved by experiments to have no existence, he therefore asserts my theory to be erroneous. Sir, if Mr. P. means by *constant*, that the excess of the underneath resistance is *constantly equal*, I cannot agree with him, inasmuch as there are many causes operating to produce inequality in this excess of resistance; and even were this excess *constantly equal*, then, from the circumstance of its being exerted at an *ever varying* distance from the centre of gyration of the vessel, the effect of such an assumed *constantly equal* force would be productive of an *ever varying* effect upon the ship's course. And when Mr. P. considers that the action of the resistance of the water to the screw is not concentrated in any one point, either underneath, above, or laterally, and that a solution of a question which appears on a first view to be correct, may, upon greater strictness of analysis, be found to be erroneous, I think he will admit with me that it will save him and me some labour, and your readers some wearying thought, if we leave the demonstrations of my theory of the action of the screw upon the steerage of the vessel to a future opportunity. I assure Mr. P. that this theory has not been so superficially and lightly taken up as he imagines, nor is it entirely unsupported by facts.

Your readers, Sir, will recollect that my argument went to prove, that when the screw revolved slowly, and when the ship was gathering way, from an inequality in the resistance of the water to different parts of the screw, there would be a tendency in this inequality to make the vessel turn round or from a straight course; but that as the way of the ship became greater and greater, this tendency of the ship from such a course would become less and less, until when the ship had acquired full way, and the screw revolved with great rapidity, this divergence from a straight course, for want of the element of time in a sufficient quantity, would be confined to producing a sort of minute gyrating motion in the head of the ship, round a certain point, the effect of which would be to neutralize the action of the force, tending to produce a divergence of the vessel from a straight course. In the adaptation of the principle of the screw to propelling purposes, made by Captain Ericsson—in which application the rate of revolution of the instrument was about that of a common paddle-wheel, and in which *two* oppositely revolving screws were used on one centre—in this application, I say, it was found necessary to make one part of the apparatus revolve faster than the other, thereby proving that a comparatively *slow and equal* rate of revolution for *all* parts of the screw rendered the steerage of the ship imperfect. This application of the screw was not one which never had existence except upon paper, but, on the contrary, was tried on two or more vessels.

If I thought my theory of the action of the screw on the steerage of a vessel required further support, I would ask Mr. Phillips what could have induced so skilful an engineer as Capt. Ericsson to use *two* screws at all, when *one* would, if Mr. P. were right in his opinion, have done as well? And also would the *Archimedes*, if the upper part of her screw were out of the water, move on a straight course?

While Mr. P. was making enquiries of Captain Chappell, I regret he did not make one in this form. Did you, Sir, ever make a trial of the effect of the screw-propeller, upon the steerage of the *Archimedes*, when this vessel, *in still water, without sail, with the helm firmly held amidships, and under the propulsion of the screw alone*, moved from a state of rest to one of rapid motion, without the vessel's inclining from a straight course? Now, should such a trial never have been made, I cannot tell how, except as a matter of opinion, it can be shown that the screw has no influence on the steerage of the vessel when it is moving slowly.

Perhaps a few general remarks upon the theory of Mr. Phillips for calculating the propelling power of the screw, and my own, for the same purpose, may not here be out of place. Mr. P., by assuming the resistance of the water to the rotation of the screw to be the measure of the propelling power, supports a theory under which I have produced two suppositions, involving palpable absurdities, which even Mr. P. admits to be "irresistible." If more suppositions of this kind were necessary, I could supply them; but the two I have already given should, I think, be deemed sufficient to shake confidence in Mr. P.'s theory. How, I would ask, are we better able to test the accuracy of any theory than by applying it in extreme cases; and, if under a fair trial of this kind, a theory produces results which are known to be absurdly erroneous, what reliance can be placed upon it? I confess I must answer—none. What is the case under such a trial with the theory I have given? Let us see.

By considering the resistance of the water to the rotation of the screws to be not at all identical with the propelling power, and by estimating this power in the manner I have

proposed, from the direction of the surface in conjunction with the direction of the rotation of such surface, I arrive at no absurdities; and, test my theory how we may, none can be produced. But it may be said that my theory resembles, in the total, no one before known. Sir, incompleteness in the theories before given of the action of the screw as a propeller, may very well be excused, considering that, until lately, scarcely any one thought it possible that the screw would ever be used for such a purpose; and men of science might very well pass over, without any strict examination, things not likely to be useful, while they devoted their attention to attaining accuracy in processes tending to indisputable utility. Should we find (which I hold to be impossible) that the screw is really an economical propelling instrument, we shall not long want processes, at the hands of labourers of known and admitted standing in science, for computing the propelling power of this instrument, as accurate as any we have for estimating the power of other machines.

The theory I have given might be strengthened by two other collateral processes, and, by consequence, Mr. Phillips's theory weakened to the same extent; but what, Sir, would be the use of proving a defective method *thrice* bad? I must confess it to be almost a waste of time to consider the principle of the instrument at all; and, indeed, it never would probably have been examined to the extent it has, but for the performances of the *Archimedes*, these being, as I think, due more to the power and build of the vessel than to any inherent good qualities of the propeller with which it is fitted. I would here call to the recollection of your readers that my original article in this discussion consisted of two parts, one being the theory and the other part consisting of remarks upon the report of Captain Chappell. Sir, it is no small argument in favour of the general accuracy of my theory, that, taking the theory as a text, I found the commentaries in the facts recorded in the report just mentioned.

In this place I may perhaps remark, that, were Mr. P.'s theory correct, the application of it in the *Archimedes* is any thing but the best, seeing that, by the most advantageous modification, we might get rid of almost every objectionable feature of Mr. Smith's plan; but then such a best application would at once effectually demonstrate the indefensibility of Mr. P.'s theory.

A few more words to conclude. However valorous Mr. Phillips is as a knight, little can be said for his courtesy and consistency. In one part of this gentleman's last communication, he says, "the error of Mr. Holebrook may have arisen from the misfortune of his having undertaken the discussion of a matter he was wholly unacquainted with," while, in another part, he says, "I shall now quit the field, to return to it again, however, should any further attempt be made by Mr. Holebrook to call in question *the manifest superiority of screw-propellers over paddle-wheels!*" Now, Sir, had I blundered, mistook, erred, and misrepresented, as Mr. P. states I have, I would ask any one, in a state of calmness, whether Mr. P. would not much better have shown his sense of security by allowing me to blunder on, rather than by acknowledging that I have the power to draw him into the field whenever I may think proper to do so. I thank this gentleman, however, for this confession, conveying, as it does, the admission that the observations which I have made, though they be not of any important character, are yet, nevertheless, not exactly those of a person "so wholly unacquainted with" the subject under discussion, as Mr. P. thinks they are.

Before I conclude, in order to avoid another charge of unfairness of desiring to have the last word, I beg Mr. Phillips to understand that I have no such desire, and that I concede to him every advantage which he may consider to belong to that circumstance; and I further inform him, that, unless I see more reason to alter my determination than I do at present, it is not my intention to continue this discussion further.

With many thanks for the space you have afforded me for these observations, and with every apology for my too great trespass,

I beg to subscribe myself, Sir,

Your most obedient servant,

J. P. HOLEBROOK.

168, Devonshire-place, Edgeware-road,
Dec. 18, 1840.

ENQUIRY RESPECTING BLAST FURNACES ANSWERED.

Sir,—In your Magazine of October 31st, a question is asked relating to blast furnaces. Expecting to have seen an answer from some of your correspondents abler than myself, I deferred till now giving any myself.

I am your constant reader,

C. WRIGHT.

Pant, near Ruabon, Dec. 21, 1840.

Two tuyere pipes, 4 inches diameter each, blowing with a power compressed to 3 lbs. on the inch, will require 6831,5340 cubic feet of air per minute.

Perhaps I shall ask, through the columns of your Magazine, a question on the properties of hot blast iron, which breaks of a silver-looking fracture, and is as tender nearly as glass, as soon as my time will permit me to do so.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

THOMAS EDMONDSON, MANCHESTER, CLERK, *for certain improvements in printing presses.*—Petty Bag Office, Dec. 9, 1840.

These improvements relate to an ingenious mode of printing railway tickets, successfully introduced on the Manchester and Leeds railroad, on which Mr. Edmondson is employed. A machine prints every ticket with a progressive number, and arranges them in a progressive order. A tube or chamber at the back part of the machine, contains the blank tickets; a form of type is fixed face downward, just before the bottom of the tube or chamber. In front of this form there are two printing cylinders, to each of which a pall and ratchet wheel is fixed. On the faces of these cylinders there are a series of figures from 1 to 99. In front of these cylinders there is a second tube or chamber, the top of which is below the level of the bottom of the other. In the upper part of the machine, a ribbon several yards in length, saturated with ink, passes over two pulleys, unwinding from one to the other as the machine is worked, the ribbon constantly remaining between the type and the tickets. These parts are so connected as to be acted upon by a lever handle, to which is also adapted a printing table. On this handle making one vibration, another lever acts upon a notched feeding bar, so as to bring its front edge against the hindermost edge of the lower blank ticket, and force it forward on the printing table under the form of type. The fore edge of this ticket presses against the hindermost edge of the last ticket, and urges it forward under the printing cylinders: this, in passing forward, displaces the one that just before occupied that place, which being finished, falls into the lower tube or chamber. The act of pressing down the lever handle moves the printing table upwards, and gives the requisite pressure against the type and cylinders, and the ticket receives a number. On the lever handle returning to its original position, one of the cylinders takes a turn, and brings the next number of the series on its surface into the lowest or printing position, when the same operation is repeated, and thus 10,000 tickets may be printed, all varying in their respective numbers. Two boys recently printed off the impression of 10,000 tickets in four hours. The inking ribbon will print 25,000 impressions without a renewal of the ink. Each of the tubes holds exactly 500 tickets.

WILLIAM PONTIFEX, SHOE-LANE, BRASS FOUNDER, *for a new mode of obtaining dye colour, tannin, and acids, from vegetable substances.*—Enrolment Office, Dec. 12, 1840.

Within a large cylindrical vessel there is fixed a false bottom, perforated all over with small holes, dividing the vessel into two parts or chambers. To the lower chamber a forcing pump is affixed,—to the other an air vessel, furnished with a safety valve. A strong beam runs across the top of the cylindrical vessel, supported upon brackets, and held in its place by bolts. A screw, which works through this beam, has attached to its lower end a cover, fitting the interior of the vessel, and perforated all over like the false bottom. When the process of extracting dye, &c., is to be performed, the bolts are taken out, the cross-beam, screw, and cover removed, and the substance to be operated upon, in a powdered or finely-divided state, is placed upon the perforated bottom. The cover, &c., is then replaced, and the screw turned round, until the cover is pressed down on and compresses the matters to be acted upon. Water, at a temperature of 160° Fahrenheit, is then forced through the mass by means of the pump, (the pressure being regulated by the air vessel and safety valve), and extracts the dye or other property of the substances thus acted upon. The same apparatus is employed for obtaining tannin or acids, in a similar manner: for tannin, sumach is introduced into the vessel with the other material, and the water is injected at a temperature of 190°.

The claim is, for the method of obtaining colour, tannin, and acids from substances containing the same, by placing those substances, in a finely divided state, into an apparatus, such as that described, and forcing water or other suitable fluids through them, at a proper temperature.

RICHARD PROSSER, BIRMINGHAM, CIVIL ENGINEER, AND JOHN JAMES RIPPON, WELLS-STREET, MIDDLESEX, IRONMONGER, *for certain improvements in apparatus for heating apartments, and in apparatus for cooking.*—Enrolment Office, December 17, 1840.

The "apparatus for heating apartments" consists of a stove, which is designated "*The Vesta Stove.*" Within a suitable casing, either plain or ornamental, there is a close fire-pot, furnished at the top with an aperture closed by a sliding valve, for the introduction of the fuel, which is supported upon a grate near the bottom of the fire-pot. Beneath the fire-pot there are two compartments, the first for the temporary, and the lower one, containing a drawer, for the permanent reception of the ashes, &c. Between the bars of the grate three upright rakers are introduced for agitating the fuel, and causing the dust and ashes to fall into the receiver; these rakes are rivetted to a sliding plate, which forms the bottom of the receiver for ashes; the sliding plate and rakers are moved simultaneously by pulling a knob-handle. When this handle is drawn out,

the ashes, &c. which reposed upon it fall into the drawer beneath, and may then be carried away. If the sliding plate is not pushed back again, air would enter by the opening thus formed, and the fire would burn too briskly and waste the fuel; the sliding plate should therefore be pushed in so as to close the aperture, and the air to support combustion admitted only through an aperture provided for that purpose, and furnished with the means of accurate adjustment, according to the heat required. The sliding plate has another use, viz. for lighting the fire; the sliding plate being drawn out admits of a light being applied to the combustibles lying on the grate; after the fire has burnt up, the sliding plate is pushed in, and the supply of air admitted through the regulated aperture only. A smoke pipe passes off from an opening in the upper part of the fire-pot into a flue or chimney; the external casing of the stove has a moveable top, which is taken off when fuel is to be supplied, but rests in a ring of sand, in order to prevent the emission of smoke into the apartment.

There are also rings of sand at the bottom of the fire-pot, in order to prevent atmospheric air from finding its way into the chimney without passing through the fire. In this stove the heat plays between the fire-pot and the external casing, but the smoke passes directly from the fire-pot to the chimney.

Another modification is shown of a stove on the same principle, but in which the smoke is allowed to come in contact with the external case before it gets into the chimney, access to the apartment being cut off, as before, by sand rims.

A third modification is furnished with two smoke pipes, the one near the top, the other towards the bottom, the upper one being adapted to situations where chimneys have a bad draught, the lower one to good draughts. The upper part of the fire-pot terminates in a reservoir for fuel, with a moveable cover and sand rim. The cover being taken off, fuel is placed in this receptacle, and the cover replaced; on drawing out the slide valve the fuel falls into the fire-pot, without any escape of smoke or dust into the apartment.

A stove suitable for forcing houses is constructed on a similar principle, but is surrounded with an external case, leaving a space between the two, which is supplied with external air through a pipe; this air being heated ascends to the upper part of the external case, when it branches off to the parts where warmth is required, by means of conducting pipes. Two or more pipes may be used, according to the requirements of the situation. In order to prevent the air being too hot on escaping from these pipes, there are reservoirs of water placed at intervals, through which the hot-air pipes are led; holes are perforated in the pipe between each of the reservoirs, for the emission of the warm air into the apartment. These holes may be so regulated, by opening or closing them, as to emit any required quantity of hot air into the apartment, the excess passing out at the extremity of the pipes into the atmosphere. By this arrangement, while the heated air is so reduced in temperature as to prevent injury to vegetation, any degree of moisture is communicated to the air of the house by evaporation, which is often advantageous, and sometimes essential, to horticultural operations.

In another arrangement a stove is shown in which the external case must be removed in order to supply fresh fuel; in this stove the smoke does not come in contact with the outside case, but passes directly from the fire-pot to the chimney. In this construction of stove the rakers are moved independently of the sliding plate, being attached to the end of a rod; upon the end of this rod, and at right angles to it, a plate of iron is fixed, and when the rod is pushed in, this plate stops an orifice leading to the chimney, the use of which is to allow the dust caused by the rakers to pass into the chimney instead of escaping into the apartment. The rod which moves the rakers passes down the centre of the air pipe, and the rakers are situated between the bars as before described.

The improvements "in apparatus for cooking" consist of a rectangular iron box, and a portable fire-pot or pots, inside thereof, supplied with air through a regulated aperture, and furnished with a pipe for conveying the smoke into a chimney. The top of the box becomes heated by the internal fire, and forms a hot plate upon which the ordinary cooking operations can be conducted. At one end of the top of the box there is an opening over which a cubical or other formed cover is placed, within which roasting may be performed; this cover has no bottom, but merely serves to keep in the heat and surround on all sides (except the lower) the article to be roasted.

A coal or fuel hod is next described, which is used for supplying stoves of the foregoing description with fuel; it resembles a square pail closed at the top, and furnished with a sliding bottom. The hod is charged by turning it bottom upwards and withdrawing the slide; when it is filled the slide is pushed in, the hod inverted and carried by a swing pail handle. The slide is furnished with two holes, one at the projecting extremity for the insertion of the fingers, another of a rectangular form just within the former, which fits on to a projection on the sliding

valve on the top of the fire-pot. The fuel hod being placed on the top of the fire-pot in the stove, the projecting piece fits into the rectangular opening in the slide, and consequently the slide of the hod and of the fire-pot are by this means opened or shut together.

The two slides being simultaneously opened, the fuel falls into the fire-pot; on pushing the handle back, both slides again move together, and the holes in the top of the fire-pot and the bottom of the fuel hod are both closed. The fuel hod is then removed and the moveable top of the stove replaced. In this operation any dust or smoke which arises passes into the fuel hod and is carried away; none can escape into the apartment; because the slide on the top of the fire-pot is never opened except when the fuel hod is in its proper position.

Reference is finally made to a peculiarly constructed stove (the Chunk stove), patented by Mr. Prosser, February 17, 1839, for the purpose of more clearly pointing out the difference between that and the present inventions, which are very fully described, and most minutely particularised in fourteen sheets of drawings.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for Aug. and Sep., 1840.]

An Improved Method of Manufacturing Sulphuric Acid. *J. Hargreaves; August* 24, 1839.—"I cause," says the patentee, "the sulphur to be burnt in a pan, in a close furnace, by fire below the same; and the vapour arising from the combustion of the sulphur is forced and driven, by a blast of atmospheric air from the furnace, through a tube leading therefrom to a close receiver filled nearly full of water, and discharged near the bottom of the receiver, in such manner that the vapour ascends through the water to its surface, and by combining with the water, forms sulphuric acid. I also cause the vapour to be met by a blast of steam and atmospheric air while yet in the furnace, and before passing into the receiver, to cause the vapour of the sulphur, or sulphurous acid, to combine with one more equivalent of oxygen, a dry atmosphere being unfavourable to the combination; and the vapour, after passing through the water in the first receiver, rises through another tube fixed in the top of that receiver, and passes through another receiver in the same manner, and so through a third, or more, as may be found expedient; and as the acid, in a concentrated state, is drawn from the first receiver by a cock at the bottom, the weaker acid from the second receiver is drawn into the first, and that of the third into the second, and thus the water being placed in the last receiver, passes through the several receivers, becoming more and more concentrated, until it is drawn from the first receiver in the form of sulphuric acid.

"In order to render the process more effectual, I insert in the receivers horizontal shelves, to cause the vapour to pass a greater distance through the water, and these shelves, as well as the receivers, should be covered with lead. The blast of atmospheric air may be made with a cylinder with double blast, or in any other manner to make a steady and uniform blast, and the blast of steam may be made by a boiler over the sulphur furnace.

"What I claim as my invention is, the manufacturing sulphuric acid in the manner herein set forth—viz. by introducing a blast of air to force the vapour of the burning sulphur through the water in the receivers, and by introducing a jet of steam with atmospheric air into the furnace, to meet the vapour of burning sulphur, as herein described."

For Supplying Ink to the Pens of Ruling Machines; *Lewis Edwards, August* 31, 1840.—The ink is to be contained in a trough extending along at the heads of the pens, and into this trough one edge of a piece of cloth is to dip, whilst the other portion of the cloth lies upon the pens, and supplies them with ink, by capillary attraction. Lines may be ruled with differently coloured inks, at the same time with the ordinary lines, by means of small cups of coloured ink placed within the trough, and having a strip of cloth leading from it to the pen, or pens, to be supplied. The claims are to this particular mode of giving the supply.

Ever-pointed Pencil Case; *John Hague, August* 16, 1840.—In this pencil case, the pencil is to be protruded by the sliding of an outside tube, which covers the slot on the tube within it, and the claim is to "the mode of protruding the point by a middle outside tube, the whole constructed and operating as set forth."

Dovetailing Machine; *Ari Davis Boston. August* 21, 1839.—This is an ingeniously contrived, and a well operating, machine for making dovetailed tongues and grooves on the ends of boards, for forming boxes, and other articles requiring to be similarly jointed together. The joints are to be mitre joints, and upon one of the boards the mitre is formed with a dovetail groove along it, and upon its corresponding piece, a dovetail tongue. These mitres, tongues, and grooves, are cut by circular saws fixed upon movable standards, in such a way as to be capable of exact adjustment. The claim is to the described manner of constructing this appa-

ratus so as to cut the mitre, and the tongue, or groove, at the same time."

MACHINE FOR PUNCHING METALS; *Samuel H. Brown, August* 14, 1839.—In this machine, the punch is to be forced down by the raising of one end of the lever, on which it is fixed, by the action of a cam; this cam is made to operate upon a system of friction rollers, to lessen the friction, and the claim made is to "the arrangement of the rollers, in combination with the cam lever; that is to say, placing the two rollers on which the cam acts, in a box or carriage, which travels on another set of rollers, in the manner described."

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF NOVEMBER, TO 22ND OF DECEMBER, 1840.

John Buchanan, Glasgow, Scotland, coach builder, for improvements in wheel carriages, whether for common roads or railways. Sealed; November 25.

James Molyneux, of Preston, Lancaster, linen draper, for an improved mode of dressing flax and tow. Nov. 26.

Samuel Wagstaff Smith, Leamington, iron founder, for improvements in apparatus for supplying and consuming gas. November 26.

Frederick Theodore Philippi, of Belfield Hall, near Rochdale, Lancaster, calico printer, for certain improvements in the art of printing cotton, wool, and other woven fabrics. November 30.

Alexander Dean, and Evan Evans, of Birmingham, Warwick, millwrights, for certain improvements in mills for reducing grain and other substances to a pulverized state, and in the apparatus for dressing, or boting pulverized substances. December 8.

John Hawley, of Frith-street, Soho Square, Middlesex, watchmaker, for improvements in pianos and harps. (A communication.) December 9.

Francis Molineux, of Walbrook Buildings, London, gentleman, for improvements in the manufacture of candles, and in the means of consuming tallow, and other substances for the purposes of light. December 9.

Joseph Leese, jun., of Manchester, Lancaster calico printer, for improvements in the art of printing calicoes and other surfaces. December 11.

Philippe Marie Moindron, of New Ormond-street, Middlesex, merchant, for improvements in the construction of furnaces, and in boilers. (A communication.) December 17.

John Cartwright, of Loughborough, Leicester, manufacturer of hosiery, Henry Warner, of the same place, manufacturer of hosiery, and Joseph Haywood, of the same place, frame smith, for certain improvements upon machinery, commonly called stocking frames, or frame work knitting machinery. December 22.

IRISH PATENTS FOR DECEMBER, 1840.

George Gwynne, for improvements in the manufacture of candles, and operating upon oils and fats.

G. A. Gilbert, for certain improvements in machinery or apparatus for obtaining and applying motive power.

A. E. Walker, for improvements in engraving by machinery.

M. Berry, for certain improvements in machinery or apparatus for making or manufacturing pins and sticking them in paper.

A. Wall, for a new composition for the prevention of corrosion in metals, and for other purposes.

NOTES AND NOTICES.

Action of Sea Water on Glass.—At a recent meeting of the Philosophical Society of St. Andrew's, Sir David Brewster exhibited a bottle of wine from the *Royal George*, which had been exposed to the action of sea water. This bottle he received from Mr. Lyell, of Kinnerdy, for the purpose of examining the remarkable decomposition of the glass produced by the action of salt water. The thin films of glass which covered the bottle like a silvery incrustation had all the properties of the brilliant scales of decomposed glass found in Italy, and produced by nearly 2000 years exposure to the elements. Upon a careful examination of the surface of the bottle, Sir David found that the scales were throughout filled with veins like those of agate, and coincided with the lines in which the glass had been twisted in the mechanical operation of forming the bottle. The lines in which the cohesion of the particles of the glass was the least were the soonest decomposed by the action of the sea water. This curious fact disclosed the cause of the similarly waved structure in the decomposed glasses of Greece and Rome.—*Scotsman.*

Plaster Casting.—Plaster of Paris is sulphate of lime, or gypsum, deprived of its water of crystallization by heat. In this state it has such an affinity for water, and is capable of taking up so much, that when the powder is mixed with water till it becomes of the consistence of cream, it sets after a few seconds into a hard mass. In the manufacture of plaster casts, we must pay attention to several little niceties, in order to get rid of all the air bubbles. These arise from two causes, either from the adhesion of the air to the plaster, or from the plaster carrying down air with it, when added to the water. The first is to be remedied by using fresh burnt plaster, which is always adopted by the cunning stereotypers, for they state that if it simply stands a fortnight, the casts will not be so good. The workman cannot explain this, but the rationale was well known to Mr. Wyatt, our celebrated sculptor, who told me that he attributed it to the adhesion of the air; and that thus many delicate casts were injured. He places the common plaster in a saucepan over the fire, and heats it, when it heaves from the discharge of the gas, and is then ready for use. Sufficient plaster should be placed in a basin, and water poured upon it till it is completely covered, and all bubbles cease to rise, when it must be thoroughly mixed by rubbing it together. The surface to which it is to be applied should be slightly brushed over with a very small quantity of salad oil. A little fluid plaster may then be poured on the cast, and with a hog's bristle painting brush thoroughly rubbed into all the fine parts, which will prevent the adhesion of any air bubbles in the plaster which might prevent a perfect impression. Another portion of plaster, sufficient to give the desired thickness is now to be added, and time must be given for the whole to set, when it should be removed from the mould, and gently heated to drive off excess of moisture.—*Smee's Elements of Electro Metallurgy.*

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Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 909.] SATURDAY, JANUARY 9, 1841. [Price 3d.

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THE VESTA STOVE.

Fig. 1.

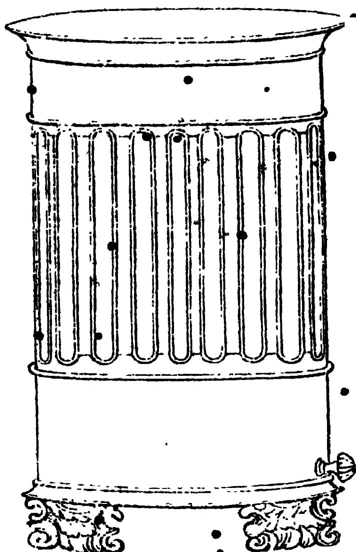


Fig. 2.

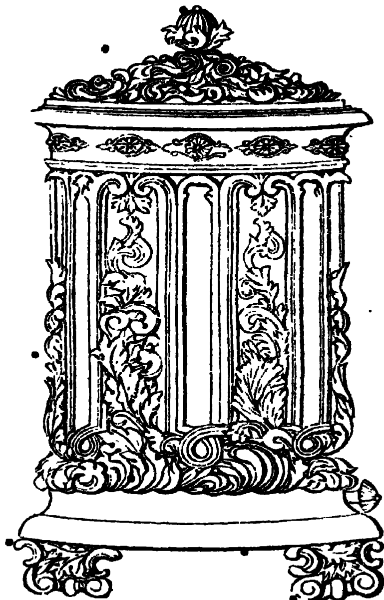


Fig. 3.

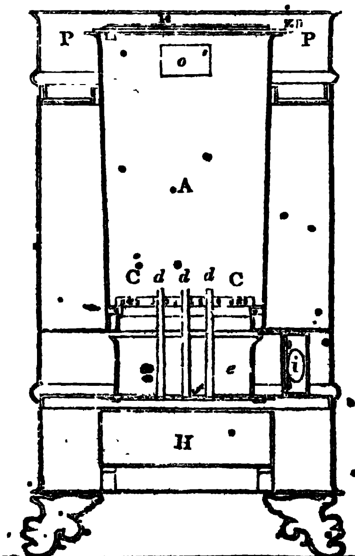
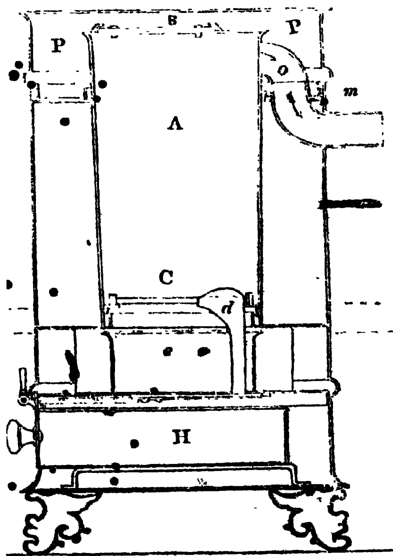


Fig. 4.



THE VESTA STOVE.

In our last number (p. 13) we gave a brief abstract of Messrs. Prosser and Rippon's specification of their recent patent for "certain improvements in apparatus for heating apartments and for cooking," and we could give many satisfactory reasons, if needful, for just now returning to the subject.

> "'Tis done! dread Winter spreads his latest glooms,
> And reigns tremendous o'er the conquered year."

Doubtless the season affects us, and renders everything savouring of warmth and comfort peculiarly congenial to our feelings at this time; nay, we fancy we could be content to expatiate upon the merits of stoves throughout a double Number, would our readers but bear with us.

It is extremely interesting to observe the great amount of talent that has been devoted to endeavours to perfect improvements in "heating apparatus;" yet somewhat mortifying to reflect that so little real improvement has been the result. We cannot, however, afford space to enter upon a review of the peculiarities of every invention which is even now the object of an unequal and unsuccessful struggle for public favour; suffice it to say that all their several advantages seem to be fully realised, and all their objectionable points obviated, in an omnipotent rival, "the patent Vesta Stove," which we beg this week to introduce to the particular notice of all our "shivering friends."

It may be remembered, that we took occasion last winter (vide No. 851) to expatiate at some length upon the patent Chunk Stove, which Mr. Prosser was just then most opportunely bringing out to alleviate the sufferings of "chilly mortals." Some of our readers might at that time have thought our description, if not exaggerated, to be somewhat highly coloured—the advantages to have been rather overrated; but we were practically certain that our good opinion rested upon a basis not liable to error, and we spoke the language of philosophical conviction, free from any bias of prejudice or partiality. It is with some degree of satisfaction, therefore, that we see upwards of *two thousand* testimonials from purchasers, to the healthfulness, simplicity, economy, safety, and cleanliness of these stoves, when used in the varied situations of drawing-rooms, bed-rooms, nurseries, entrance halls, offices, green-houses, forcing-houses, and forcing pits. Some of these parties were, doubtless, induced to try the Chunk Stove upon the faith of our recommendations, and several persons have most explicitly declared that, *the Chunk Stove, in every respect, fully bears out the high encomiums which we passed upon it.* The Chunk Stove is still held in high estimation by those for whose situation it is suitable, and it is giving very great satisfaction where Dr. Arnott's and other stoves could not be made to do so.

The success of this contrivance, as a commercial speculation, has been almost unparalleled, and it might be thought that the fortunate patentee should "let well alone." It happened, however, that in the course of manufacturing and experimenting upon an extended scale with the Chunk Stove, it was found susceptible of such considerable improvements as to justify its ingenious proprietors in making them the subject of another patent.

It is stated that the absence of variety in size and ornament, which cannot be applied to the Chunk Stove beyond a limited extent, had in some cases caused disappointment. The mode of supplying the fuel was also under some circumstances considered objectionable.

To meet these defects, therefore, in the most satisfactory manner, the "Vesta stove" has been produced, combining all the advantages of the "Chunk," with others peculiar to itself.

The Vesta stove is adapted to either an ascending or a descending flue, with the certainty of acting efficiently either way, without any difficulty in fixing; it admits of every conceivable variety of ornament, can be made of various materials, and of sizes suitable for the smallest apartment or the largest church

The Vesta stove is made in three ways, plain, fluted, and ornamental. Figs. 1 and 2 on our front page, are elevations of the two latter: figs. 3 and 4 being internal sections at right angles to each other, from which, the construction and action of this stove may be easily understood. The Vesta stove is composed externally of a cylindrical casing or envelope mount-

ed on a suitable stand, furnished with a moveable top resting in a ring of sand. The fuel, which may be cinders or coke, is contained in a close furnace or fire-pot A, furnished on its top, with a sliding plate or valve B. The fuel is introduced by an apparatus presently to be described, through the aperture form-

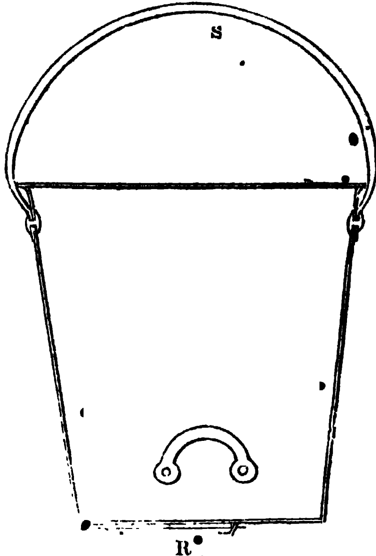


Fig. 5.

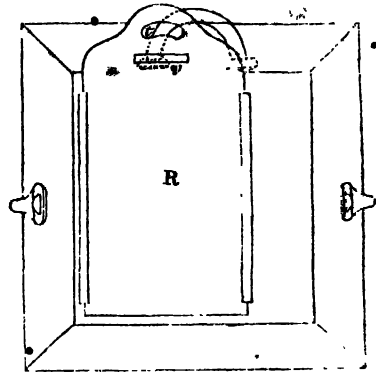


Fig. 6.

ed by opening the sliding plate B, and the smoke is prevented from passing directly out of the fire-pot, by closing the slide; it therefore escapes through the smoke pipe *o*, and thence to a chimney, as indicated by the arrows. The fuel rests upon a grate C near the bottom of the fire-pot; between the bars of this grate, three rakers *d* are introduced, for the purpose of agitating the fuel and causing the ashes to fall down upon a receiver *e*. These rakers are rivetted to a sliding plate *f*, which forms the bottom of the receiver for ashes; the sliding plate and rakers are moved simultaneously by means of the handle G: when this handle is drawn out, all the ashes and cinders which rested upon it fall into the drawer H, placed beneath for their reception, and may then be carried away. The atmospheric air necessary for supporting combustion is admitted through an aperture *i*, in the side of the stove furnished with a convenient apparatus for regulating with great nicety the quantity of air admitted, and thereby the rate of combustion within the stove. If the sliding plate is not pushed back by the handle G, a rush of atmospheric air would enter through the opening thus formed (in the bottom of the receiver for ashes,) and the fire would burn too briskly, rapidly wasting the fuel; it is necessary therefore to keep this aperture closed, and confine the admission of air to the definite limit of the regulated aperture. When first lighting the fire, however, the sliding plate may be advantageously withdrawn, and the combustibles lying upon the grate ignited by holding a light to the under side of the grate; as soon as the fire has burned up, the sliding plate is to be pushed in and the supply of air adjusted as before directed. The layer of sand between the lines *k k* and *l l*, is for the purpose of preventing any atmospheric air from finding its way into the chimney otherwise than through the fire-grate; and the sand rim, *m m*, near the top, in which the moveable top rests, prevents the emission of smoke into the apartment.

The very ingenious contrivance for replenishing the Vesta stove with fuel is shown in figs. 5 and 6; the former being a side elevation, the latter a plan, of what

is termed in the specification, "a coal or fuel hod." This feeder is a sort of square iron pail, with a slide R at the bottom; this slide being turned uppermost, is drawn out and the "hod" filled with fuel, through the aperture thus presented; the slide is then shut and the "hod" inverted, being carried by the swing handle S, in which position the slide becomes the bottom of the vessel upon which the fuel rests. There are two holes in the slide, one for the insertion of the fingers in order to move the slide, the other a rectangular slit *v*, which fits on to the projecting piece *z* of the sliding valve B on the top of the fire-pot A. The fuel hod being charged, it is placed on the top of the fire-pot (the moveable cover of the stove being previously lifted off) with the projecting piece *z* fitting into the rectangular slit *v*; on drawing back the slide of the fuel hod, the slide on the top of the fire-pot is thus drawn with it, and the fuel falls into the furnace. On pushing back the handle, both slides again move together and the opening in the top of the fire-pot and the bottom of the fuel hod are simultaneously closed. The fuel hod is then removed from the top of the fire-pot, and the moveable cover replaced in its proper position, upon the top of the stove. In this operation, any smoke or dust that arises, passes into the fuel hod or feeder and is carried away; none can enter the apartment, because the slide on the top of the fire-pot is never opened except when the fuel hod is in its proper position. The peculiar construction of the feeder and the internal part of the stove is such, that neither the stove nor feeder is seen open; the fuel falls from the latter into the former without the fuel being seen, an advantage which no other stove possesses; avoiding entirely that annoyance of dust occasioned by throwing fuel into the stove, or, what is worse, into a funnel to convey into the stove, as is done in Dr. Arnott's, and all stoves except the Vesta. The fire may be kept lighted a whole season, without any annoyance from dust, or inconvenience from clinkers.

That a Madeira climate in England may be produced by the Vesta stove, plants of the most tender kind requiring warmth have proved; in sick rooms it has been found invaluable, producing one even degree of temperature throughout the day and night.

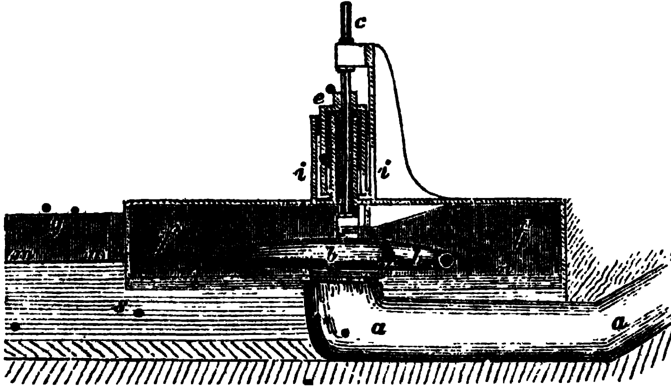
The Vesta stoves have no doors from which the gases or impure air can escape, as they do from every stove having doors, however well ground and fitted those doors may be; and as there is no fire or heated substance in contact with the outer case, the air that comes in contact with it is only warmed, and not destroyed.

Although they are ventilating stoves, they are so constructed that the air required to carry on combustion need not be taken from the apartment in which the stoves are placed, as the external air can be brought into the body of the stoves. This for forcing-pits and green-houses forms a very important feature in these stoves; and it is also of great advantage where chimneys emit the smoke into the apartment instead of discharging it at the top (commonly called smoky chimneys); with these stoves so applied, it is impossible for any chimney to act improperly, owing to the absence of doors. The method of bringing in the external air has been applied to the Arnott stoves, but without the slightest advantage; indeed it had only the effect of causing an increased escape of the noxious vapours from the door of the stove. With the Vesta stove it will at once be seen these unpleasant effects cannot possibly occur, as the vapours must be forced up the chimney only, there being no other outlet. This method of supplying air is not necessary except where the chimneys are bad.

For the first few days the fuel will be consumed in much less time than it will be afterwards, and the fire will therefore require attention a little earlier than the following stated times, which will be as frequent as it is necessary to replenish the fire, &c., after the stoves have been in use for two or three days:—For the 14-inch stove every 12 hours; the 16-inch every 18 hours; the 18-inch every 24 hours. Where Welch coal is used, add 6 hours to the above time.

The 14-inch stoves consume about three halfpenny worth of fuel in 12 hours, and are suitable for rooms from 8 to 16 feet square; the 16-inch consume about two penny-worth of fuel in the same time, and are suitable for rooms from 16 to 28 feet square; the 18-inch consume about three penny-worth of fuel, and are suitable for rooms from 28 to 48 feet square.

IMPROVEMENT IN MESSRS. WHITELAW AND STIRRAT'S WATER-WHEEL.



Sir,—The accompanying drawing shows a plan, which, with the assistance of Mr. George Whitelaw, I have invented for keeping the new patent water-mill out of tail-water. *a a*, is the main-pipe, *b b*, are the arms of the machine, and *c* is the top of its shaft. The arms work inside of an air vessel *f f*, which is fixed down to a building, and is covered on the top, but has no bottom. The shaft passes freely through a hollow cylinder fixed above an opening in the top of *f f*, and there is another hollow cylinder *i i*, fixed also on the top of *f f*, and so large in diameter inside as to leave room for a third cylindrical part *e*, which is fixed upon the upright shaft to re-revolve easily in the space left between the other two cylinders. The top of *f f*, forms a bottom to the space which is between the two cylindrical parts first named, and *e* is fixed upon the shaft in such a manner that the joining will be air-tight. An inspection of the drawing will make the arrangement, &c. of the cylindrical parts intelligible. *g* is one side of the tail-race; *s* is the opening through which the water escapes from *f f*, into the tail-race.

Suppose now the space into which the cylinder *e* works sufficiently filled with water to form an hydraulic joint of the kind very commonly used in gas works; then, if the machine is set in motion, the air, which will in some instances be disengaged from the water, will remain in the vessel *f f*, and press down the surface of the water in it to the level *n n*, or even lower. In this way, the arms of the machine, although on a level below that of the surface *m m*, of the water in the tail-race, will work clear of the tail-water.

It may be found necessary to use a small pump to force air into *f f*, in order to lower the surface of the water. By running a quantity of water from the main pipe into the air-vessel through an arrangement of pipes similar to the water-blowing machine, air will be carried into *f f*. The space within which the cylinder *e* works may be supplied with water by a small pipe leading from *a a*.

A water-mill composed of two round plates, the one forming the top, the other the bottom of the passages for the water, with plates on edge and properly bent, running between them from the centre outwards, so as to make the space between the round plates all into arms, will work very well in tail-water. If a ring, projecting downwards is fixed to the under plates, then the bottom of the machine will rub on a film of air, instead of on water, and thus the friction will be diminished. This plan may be used instead of the one herein described, in certain cases.

By giving the above a place in the *Mechanics' Magazine*, you will oblige,

Sir, yours very truly,

James Whitelaw.

Glasgow, Dec. 29, 1840.

WINKLE'S PATENT PADDLE-WHEELS.

Sir,—Theory has been truly described as being without hands; and when the fallacious predictions of theoretic men are considered, we are almost tempted to believe that theory is without a head as well as without hands.

Theory has conclusively demonstrated the impossibility of steaming across the Atlantic. It has with pompous dogmatism (and but a few years since) demonstrated, yes, algebraically demonstrated, that a steam coach could not ascend a hill on a common road. The best angular position that theory assigned for the sails of a windmill, was proved by practice to be the very worst. The fact is that theory overlooks what practice detects, and being ever liable to error, should confine itself to its legitimate province of opening new fields for the enterprise of ingenuity, and never attempt to damp the ardour of practical skill by exclaiming, with a grave shake of the head, "*Ah, it wont do!*" Your correspondents, Mr. Holebrook and Mr. Phillips, must know that notwithstanding all the theory that each can adduce in favour of the screw-propeller or the paddle-wheel, it is actual experiment that must ultimately decide their respective value. But supposing the screw to be more powerful than any paddle-wheel ever yet constructed, does it follow that no improvement can be made on the latter that will leave its rival the screw no chance of competition? Many scientific men have declared that the commonly constructed paddle-wheel will not admit of any considerable improvement, and it is a fact that many attempts to improve it have failed, and, in many cases, have introduced more glaring defects than those intended to be obviated.

The objections to the common paddle-wheel are, the quantity of water lifted by the boards while emerging from the water, and the consequent loss of power if a deep stroke be taken; the difficulty of moving in a heavy sea; and the resistance offered to the paddle-boards in striking the water with the breadth of their surfaces. Could all these inconveniences be obviated without any complicated machinery or sacrifice of strength in the wheel, it might reasonably be concluded that the paddle-wheel would effect a very considerable increase in the speed of a steam vessel.

Such a wheel as I have supposed, has been constructed in model, and secured to the inventor by patent. It obviates all back water, it works well when completely submerged, the paddle-boards enter the water edgeways or with any required obliquity, the stroke will commence and terminate at any required point, and in addition to these advantages, one wheel can in an instant be rendered ineffective whilst the other continues in full action, and the head of the vessel moved round with as much facility as a boat by an oar. All reasoning *à priori* confirms the excellence of such a wheel, and we shall soon be able to reason *ab actu* on its merits, as Winkle's Paddle-wheel will shortly be put to the test of actual experiment. In the interim, Mr. Editor, as the above-mentioned wheel must in the course of your professional avocations come under your notice, the public will have an opportunity of receiving an opinion untinged by prejudice and in accordance with the candour and impartiality of the *Mechanics' Magazine*.

Yours, &c.
A. Storer.

1, Popham-terrace, Islington,
Dec. 18, 1840.

[An abstract of Mr. Winkle's specification, will be found at page 589 of our last Volume.—Ed. M.M.]

THE THEORY OF PARALLEL LINES.

Sir,—Your geometrical correspondent, Mr. Sankey, is determined, *if possible*, to remove the blemish from the 1st Book of Euclid's Elements, on the Theory of Parallel Lines, the said theory being founded on the assumed truth of the 12th axiom, which axiom no doubt involves in it a proposition of the most difficult order. Mr. Sankey in his late article (vol. xxxiii, p. 524.) assumes the existence of one rectangle, and then, from this assumption, he demonstrates with great ease, that the three angles of every plane triangle are equal to two right angles. We can easily construct a plane quadrilateral having three of its angles right angles, but to assert that the fourth angle may in some cases be also a right angle, and this without anything in the shape of proof, is really asking more than can with geometrical strictness be granted. Such an

axiom or postulate, or by whatever name it may be termed, appears to me to be more objectionable than Euclid's 12th axiom itself. It may be said that Euclid himself has asserted the existence of such figures in definitions 30th and 31st book 1st, viz. his definitions of a square and an oblong, but then let it be remembered that Euclid founds none of his propositions upon these definitions; for in the 46th proposition of book 1st, he demonstrates the truth of what he asserts in the 30th definition, and in the corollary to the said proposition, the truth of what he asserts in the 31st definition is established.

Your ingenious correspondent, "Nautilus," I perceive, has also endeavoured to perfect the theory of parallel lines without the assistance of the 12th axiom (See No. 905, p. 557), and without introducing any new definition or axiom. His aim is to demonstrate the truth of the 32nd proposition independently of the 29th, viz. that all the angles of any plane triangle are equal to two right angles—a proposition from which, when once established, it will not be difficult to deduce every thing relating to parallel lines. But I am very sorry, Mr. Editor, to state that "Nautilus," in his first proposition (prop. A) has incautiously taken for granted that the three points, H, A, and I, are in the same straight line. Now the truth is, if the point G is either above or below the line B C (see his diagram), this assumption is really not true, if the point G coincide with the point F in this case (and in this case only) the three points H, A, and I, will be in the same straight line, but even then to prove that they are so (and this must be demonstrated) will be found to require the 29th proposition, and consequently an acquiescence in the truth of the 12th axiom.

But to both gentlemen I will state, that when we contemplate the immense number of geometers, and many of them of the very first order, who have attempted, but have failed in removing these blemishes from the elements of Euclid, no great degree of censure can be cast upon them, even if they should be handed down to posterity in the same list.

I am, Mr. Editor,
Yours, &c.
KINCLAVEN.

December 26, 1840.

ON THE PERFORMANCES OF THE CORNISH PUMPING ENGINES.

Sir,—I have just finished Mr. Parkes's clever paper "On the Action of Steam as a Moving Power in the Cornish Single Pumping Engine," read at the Institution of Civil Engineers, and have also read the observations thereon of Messrs. Field, Seaward, and Wicksteed. It is clear that none of these gentlemen have yet discovered the *real cause* of the superiority of duty of such engines over rotative engines. I can hardly suppose that I have solved a problem which has eluded the attempts of all our engineers. My theory is at least original and rational, and seems to me the only legitimate one, and which I think will be seen by all (like the egg of Columbus) immediately it is pointed out. As I never care about being *proved* in error, I have no objection to hazard my opinion, if you wish to have it. But it will take two papers to throw that broad light upon the subject necessary to discover the important nature of its relative bearings. This light may lead to important results, if not at once extinguished, by being declared a mere *ignis fatuus*.

I am, Sir,
Your obedient servant,
SCALPEL.

4th January.

[We need scarcely say, that we shall be most happy to receive our able Correspondent's "Theory" of the very important difference in question. ED.M.M.]

METAL PENS—SOFTENING ANIMAL MEMBRANES.

Sir,—As many people are unable to write with steel pens, owing to their *hardness*, and catching in the paper; and the quill pens being very soft, and on that account requiring frequent mending, I am satisfied that a cheap and sufficiently durable pen might be formed of many other materials, such as horn, ivory, tortoise-shell, and perhaps some of the softer metallic alloys, which would be of a *medium* character, between the hardness of steel and the softness of the quill. I purchased a *silver* pen in America and wrote with it for many years, it would not make a fine hair stroke, but it glided over the paper most pleasantly, and for letter-writing or many other

purposes, where ease and expedition were more desirable than fine penmanship, it was certainly the most useful pen I ever possessed. I have not *seen* any of the sort in London.

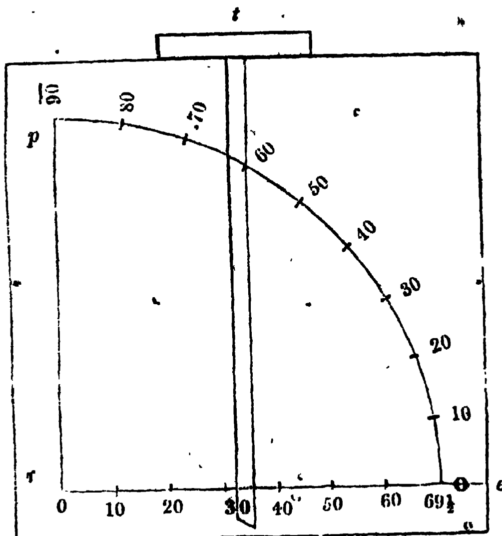
While the pen is in my hand, allow me to ask if any of your readers would be kind enough to favour me with a process whereby I could render some dried animal skins *thoroughly and permanently soft and pliable;* they have been preserved simply by *drying*, and are, consequently, too hard and inflexible to be applied to many useful purposes. I am, Sir,

A CONSTANT READER AND WELL WISHER.

Dec. 28, 1840.

[Silver pens are made and sold in London, but the objection to them is that they are deficient in durability. Mr. Hawkins' Everlasting Pen, notices of which appeared at pp. 519 and 555 of our last Volume, seems to be exactly the sort of pen our correspondent is in search of.—ED. M.M.]

GEOMETRICAL DEMONSTRATION OF THE UNEQUAL DECREASE OF THE DEGREES OF LONGITUDE IN EQUAL DIFFERENCES OF LATITUDE.



SIR,—The following is a description of a simple mechanical diagram, which, if constructed on a large scale, might materially assist a person giving lectures, in illustrating in the most simple manner the geometrical principle of the unequal decrease of the length of the degrees of longitude, in equal differences of latitude on the terrestrial globe, the insertion of the same in your valuable journal will much oblige,

Yours respectfully,

J. R. ARIS.

King-street, Stepney, Dec. 1, 1840.

The figure represents a board in a rectangular form, a common drawing board would answer the purpose very well, on which is described the quadrant *p e r p*, this is divided into ninety equal parts, to represent the degrees of latitude, the radius *r e* is divided into sixty-nine parts and a half (representing English miles,) being the length of a degree of longitude at the equator, *t* is a ruler similar to a T square, made to slide along the upper edge of the board in a direction exactly parallel to the radius *r e*, in order that the edge of the rule may always be at right angles to the said radius *r e*. To find the number of English miles contained in a degree of longitude in any given degree of latitude, slide the

rule along the top of the board till the upper part of the edge of it coincides with the given degree of latitude, and the lower part will fall on the number of miles required on the radius *r e*. On the contrary, to find the degree of latitude in which a degree of longitude becomes equal to a given number of English miles, slide the rule till the lower edge coincides with the given number of miles on the radius *r e*, and the upper part will fall on the degree of latitude required. The proportion that a degree of longitude at the equator bears to a degree of latitude, is as the radius is to the cosine of the latitude, therefore the parallel rule will transfer the cosine of the latitude to the radius *r e*, falling on the extent of English miles required. I do not mean by the foregoing operation any thing beyond serving the purpose of illustration, as by calculation, the result may be obtained to a much greater degree of accuracy by making use of a table of cosines.

J. R. A.

ATLANTIC STEAM NAVIGATION.

Sir,—The accompanying is a Table I have prepared, of the length of all the outward and homeward voyages of the New York steam-ships during the year 1840. A new steam-ship, the *President*, was in August last added to the New York line, but her performances have been anything but satisfactory; and after having made two trips out and home, she was found so miserably deficient in power as to compel her owners to withdraw her altogether for the present. Her want of speed, it seems, is not caused by any defect in the construction of her engines, which do the greatest credit to those eminent engineers, Messrs. Fawcett and Co., of Liverpool, but in their power being so utterly disproportionate to her tonnage; so that when contending against a heavy head wind and sea, as was the case in November last, they are found next to useless. The *British Queen's* performances, until about the close of the year, were not so inferior to the *Great Western's* as in 1839. But a comparison of the voyages of these two vessels, made about the same time, and in the same weather, places the performance of the *Great Western* in a most striking point of view. On the occasions just alluded to, the *British Queen* left on her outward voyage on the 2nd of November, and arrived at New York on the 22nd, after a twenty-days' passage, with very bad weather during the whole time. The *Great Western* left on the 7th of the same month, and arrived on the 24th, after a 16¾-days' passage; encountered the same sort of weather as the *Queen*, and yet beat her by four days nearly. On the homeward passages the *British Queen* left New York on the 1st of December, and reached Portsmouth on the 22nd, having been just 21 days making the passage, and experienced very rough weather. The *Great Western* left on the 9th, and arrived at Bristol on the 24th, two days only after the *Queen*, having been, notwithstanding the very tempestuous weather, but 14 days 10 hours at sea, thus beating her by seven days! In this same voyage home the *Great Western* had continuous Easterly gales and head winds for 10 days out of the 14. The quickest voyage to New York appears to have been that of the *British Queen*, in rather less than 14 days. The quickest home voyage was made in July, by the *Great Western*, in 13 days 8 hours. The longest outward appears to be that of the *British Queen*, in 20 days, and the same homeward by ditto in 21 days. The Royal Mail steam-ships—the first of which, the *Britannia*, commenced running between Liverpool, Halifax, and Boston in July last—have made their outward and homeward passages with admirable quickness and regularity. There are four splendid steamers on this line—viz. the *Arcadia*, *Britannia*, *Caledonia*, and *Columbia*, each of 1200 tons, with engines of 440 horses power. These vessels were all built and fitted by the Clyde ship builders and engineers, and I must say do great credit to them. The *Arcadia* has made two passages out and home, between Liverpool and Halifax. The lengths of the outward have been 10 and 10½ days, and those of the homeward 10 and 11 days. The *Britannia* has made six voyages in all; the three outward occupying respectively 13, 10½, and 12¾ days, and the homeward 10, 11, and 13½ days. The *Caledonia*, from not coming on the station till September, has made but three voyages; two outward, occupying 10½ and 12 days, and one homeward 11,

The *Columbia* has not yet made a single trip, but will leave on her first outward one in a few days. Much interest will doubtless be excited when the immense iron steamer now building for the Great Western Company is ready for sea, as it will then be seen what really are the advantages the screw-propeller (with which she is to be fitted) possesses over the common paddle-wheel. I know not how it may strike your readers, but it does appear to me—a disinterested person in the affair—a rather hazardous thing on the part of the Company to adopt an invention of the success of which they are not as yet fully satisfied. One voyage, however, from Bristol to New York, will be quite sufficient to decide this question.

I am yours, &c.

NAUTICUS.

Table of the Outward and Homeward Voyages of the New York Steam Ships for 1840.

Steam Ships.	Date of Leaving.	Date of Arrival.	Time Out.	Remarks.
Great Western .	Feb. 20th	March 6th	15 days 7 hours	
British Queen . .	March 2nd	March 18th	16 days	Very rough weather.
Great Western .	April 15th	May 2nd	17 days	Heavy Westerly gales and very bad weather.
British Queen . .	May 1st	May 15th	13¾ days	The quickest passage the British Queen has yet made.
Great Western .	June 4th	June 18th	14 days	
British Queen . .	July 1st	July 18th	16½ days	Experienced very rough weather during the passage.
Great Western .	July 25th.	August 10th	15½ days	
President	August 1st	August 17th	16½ days	
British Queen . .	Sept. 1st	Sept. 16th	15 days	
Great Western .	Sept. 12th	Sept. 27th	15 days	
President	October 1st	Oct. 18th	16 days 18 hours	
British Queen . .	Nov. 2nd	Nov. 22nd	20 days	Strong gales and squally.
Great Western .	Nov. 7th	Nov. 24th	16¾ days	Ditto.
	Homeward	*Voyages.*		
Great Western .	March 21st	April 3rd	13¼ days	
British Queen . .	April 1st	April 16th	14 days 7 hours	
Great Western .	May 9th	May 23rd	14 days	
British Queen . .	June 1st	June 16th	14½ days	
Great Western .	July 1st	July 15th	13 days 8 hours	
British Queen . .	August 1st	August 15th	14 days	
Great Western .	August 18th	August 31st	13¼ days	
President	Sept. 1st	Sept. 17th	16½ days	
British Queen . .	October 1st	Oct. 17th	16 days	
Great Western .	Oct. 10th	Oct. 24th	13 days 11 hours	
President	Nov. 11th	Nov. 27th	16½ days	Left originally on the 1st, and put back on the 6th to New York for a fresh supply of coals, having only made 300 miles in six days! A sailing vessel which left New York on the 10th was not passed by the President until the 26th, off Cork.
British Queen . .	Dec. 1st	Dec. 22nd	21 days	
Great Western .	Dec. 9th	Dec. 24th	14 days 10 hours	Strong Easterly gales and head winds 10 days out of the 14.

WINTER PRECAUTIONS—ICE BOARDS AND SNOW SHOES.

Sir,—Permit me to crave your assistance in calling the attention of the public to the numerous accidents which usually happen at this season, and particularly to that portion of the community who have pieces of water about their grounds, to which boys, small and great, may resort for amusement on the ice. The precautions generally used, such as ropes, ladders, &c., being either cumbrous or expensive, (and at other seasons not wanted), people do not care to be provided with them. Now, a few boards, the cost of which would not be 10s., may save many lives, and when winter is over, may be worked up. I would recommend that they should be of 8 to 10 feet long, 9 to 12 inches broad, and half an inch thick, of light Pictou timber, and near at hand. One might easily be carried under each arm, and with two or three such, a man might cross ice in safety, which would not bear a boy of half his weight. By placing them thus, T, or I, or H, and pushing one board before another, so as to rest on and support each other, he may advance, and by nailing slips across the ends of each, (which will prevent their splitting) he may draw the rear one forward, and place it in advance. He would cover *many* square feet of ice, whereas the surface of ice he would occupy by his two feet only, would not be *one* foot square. On this principle the Americans travel on the surface of snow, which would scarcely bear a cat, with what are called snow shoes, made of thin ribs of tough wood, with cords stretched across, and very light. A couple of boards might be contrived to fasten on the feet, (an old pair of shoes nailed on them, into which the feet would slip, might do), and with which he could quickly shuffle along on the ice, to succour any one in distress, carrying another board under each arm. The thing is so simple, that more need not be said on the subject by

Yours, &c,

C. G.

Moville, County Donegal, Dec. 17, 1840.

PLANS FOR VAPORIZATION AND CONDENSATION—REPLY TO MR. SYMINGTON.

Sir,—I should not have trespassed on your pages by referring to Mr. Symington's reply in your last Number, but that he has called upon me to make good my assertion that "he affirmed a saving of one-third of the fuel was effected in the *City of Londonderry*." Turn we then to your Number 901, the 14th November last, and what do we find under his own signature, and that by no means for the first time? Why, the very weight of fuel affirmed to have been *actually* saved is *calculated* to a cwt.—"18 to 20 cwt. per hour reduced to 13 or 14 cwt."—which, according to Cocker, is, in round numbers, one-third; and this, moreover, as he now admits, by so imperfect an adoption of the method, that he should not have been surprised if the speed of the engines, when that was used *alone*, had been reduced more than to 12 strokes per minute, as I had stated they were.

I may just be allowed this opportunity, as it affects my own veracity, to correct Mr. Symington's statement (now made a second time, and before misused by him in your No. 901 most unwarrantably), that I formerly asserted, or, as he expresses it, "boasted," that my process of vaporisation was *perfected* on board the *Vesta*. I might at one time have perhaps been justified in saying so, although afterwards not borne out by the test of further practice; but let that pass—I did not say so. What I asserted, and am prepared to repeat, related only to the *process of condensation*. Mr. Symington cannot but injure himself by setting up as his defence, garbled and misquoted extracts from my communications.

As to the *Dragon* having a speed even approaching that of the *Vesta*, say by two or three miles per hour, it needs no refutation from me.

But the process of condensation by reinjection (and the same remark holds good with regard to that by refrigeration) is not calculated to increase the speed of vessels under ordinary circumstances, its advantages being chiefly of another kind—namely, the saving of fuel and the promotion of the durability and security of the boilers—of which more anon. At the same time I will not suffer the invention to be taken from me by others, to whom it does not belong either legally or morally; nor will I stand quietly aloof and see it subjected in their hands to exaggerated attributes, which cannot but be ultimately injurious to its general introduction.

I am, Sir,

Your most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe, 4th January, 1841.

BRIEF REMARKS ON THE PRESENT STATE OF THE LOCOMOTIVE ENGINE ON RAILWAYS, EXHIBITING ITS DEFECTS AND SHOWING IN WHAT PARTICULARS IT MAY BE IMPROVED. BY MR. JOHN JOHNSTON.

Considering the length of time that the railway system has been in successful operation, it appears to the writer of the following remarks not a little singular, that so little should have been done towards effecting a reduction in the enormous expense attending the locomotive department. What the cause of this may be it does not become him to say, although he has thought much upon the subject; and it is with great diffidence that he submits this paper to the notice of those interested in the matter, owing to the circumstance of his not having been professionally connected with it. His object is to draw attention to the possibility of so arranging the construction of locomotive engines, as considerably to reduce their *first cost*, to increase their *durability*, and diminish their *consumption of fuel*, without at all diminishing their present *efficiency*. The facility of effecting *repairs* is also an object which he considers to be of great importance, as the more constantly an engine can be kept at work, the fewer will be the number of engines required to carry on the business of a railway. Although, as before stated, the writer has not been practically engaged, either in the manufacture or management of locomotive engines, he has, for the last ten years, devoted much of his time and attention to the study of the steam engine, in all its branches, with the view of acquiring practical information thereon; and has lately turned his attention more particularly to railways and locomotive engines, which attention has been fostered by a residence of nearly four years in Darlington; and from his having had daily opportunities of inspecting the engines on the Stockton and Darlington railway, both when in operation, when in progress of construction, and when undergoing repairs, he flatters himself that he has acquired such a thorough knowledge of the subject, as to induce him to hope that the present paper will be neither uninteresting nor ill-timed.

The present construction of the locomotive engine does not appear to have undergone any essential improvement during the last eight or ten years; and appears, in the opinion of the writer at least, to be radically defective in many particulars. It is, indeed, when in good working order, a most efficient machine, and, undoubtedly, both in reference to speed and power, produces effects which, to a casual observer, may seem all that could be wished for; yet, when we look at the stationary engine, and consider its extraordinary efficiency and durability in comparison, the conviction that there is something radically wrong in the principle of our present locomotive engine is irresistibly forced upon the mind. It shall, therefore, be his business to show in what particulars he considers the locomotive engine to be at present defective, as it is evidently an unprofitable task to attempt improvement in any thing, without being first perfectly aware of what has already been done.

It will be unnecessary here to furnish any description of the construction of locomotive engines, as this paper is only intended for the perusal of those conversant with the subject. To begin, therefore, with the boiler. This the writer considers to be very faulty. From the intensity of the heat made use of, it is imperative that every part of the surface exposed to the fire should be in as perfect contact with the water as possible; not only that the generation of steam may be rapid, but that the metal, of which the boiler is composed, may be, as far as possible, protected from the destructive influence of the heat. That the fire-box is *not* thus circumstanced can be easily shown. Its *sides* are vertical, and the bubbles of steam formed thereon being compelled to pass, not *through* the water, as they ought to do, but upwards, *between* them and it, a separation is necessarily produced between them, which exposes the fire-box to be most unduly heated. Nor is its *roof* in a much better predicament; for, owing to the space occupied by the stays across it, and to the shallow depth of water upon it, generally not exceeding five inches, and frequently being much less, *it* also is exposed, from the violence of the ebullition, to a most undue temperature. All these circumstances induce, not only rapid *wear*, but rapid *destruction*. The writer has seen the internal fire-box, of which he speaks, so bulged out between the stays, as to convince any one that it must have been nearly, if not altogether, *red-hot*. The frequent leakage of the stays is corrected by caulking, which, by jumping them up, only aggravates the evil. And the disposition of the *tubes*, too, exerts a powerful tendency to disturb the solidity of the fire-box, which is owing to their superior expansion over the outer shell of the boiler. The *unequal* expansion of the tubes amongst themselves, aided by other causes, accounts for their frequent leakage at the *ends*; and as that part of the fire-box through which the ends pass, and into which they are fixed, is generally three quarters of an inch in thickness, whilst only a very small space is allowed between them for the water, the ends of the tubes are constantly liable to be

over-heated; this causes the hoops or ferrules to be rapidly destroyed, and their frequent renewal very much injures the tubes, which thus soon require to be renewed. The intimate connexion which exists between the boiler and the working parts is also very objectionable; as independently of the straining to which the boiler is in consequence subjected, it renders extensive repairs very difficult and tedious to execute; as in the event of the fire-box or front-plate of the boiler requiring renewal, the engine must literally be taken to pieces. In fact, from the time required to thoroughly repair this description of engine, it is absolutely necessary to provide about double the number of engines which would otherwise be necessary, were it possible to keep them all constantly in working order. This circumstance, together with the very great expense of such frequent and extensive repairs, renders it very desirable that some steps should be taken to produce, if possible, a description of engine not liable to such objections. The writer is well aware of the difficulty of obtaining attention to speculations such as these, owing to the many disappointments which may hitherto have followed such attempts; and, no doubt, this prudence is commendable on the part of directors and managers of public companies; but it is respectfully submitted, that, like many other things, it may be carried too far.

With reference to economy in fuel, it is submitted, that although the introduction of small tubes has effected a surprising saving in this respect over the old locomotives, yet, it will not be denied, that there still remains a very considerable waste, owing to the shortness of the tubes in proportion to their diameter, and the very great rapidity of the draft. At first the tubes were made of only an inch bore, but it being found that with such a small diameter they were constantly liable to be choked up, and to be very rapidly worn by the cinders passing through them, as well as from the necessity of frequently cleaning them with a scraper, others of a larger diameter were substituted, in some cases it is believed of as much as two and a half inches. The writer is well aware that a patent has been obtained for an improved locomotive boiler, by a firm in Newcastle-upon-Tyne, and which is said to effect a saving in fuel of thirty per cent.; but the increased complexity of this boiler, as well as the expense of its construction, renders it very doubtful whether or not it will effect any saving in the end.

The idea which seems to exist, if one may judge from universal practice, that a sufficient *draft* cannot be obtained without running *both exhaust pipes* into *one*, is exceedingly erroneous, and one pregnant with much mischief. The obstruction caused by the contracted orifice of the *blast-pipe* necessarily gives the waste steam a tendency to escape by any other passage, were such presented to it; and as the waste steam from one cylinder exhausts a little before the *piston* of the other arrives at *half-stroke*, it is evident that it will pass into *that* cylinder, or, at least, stop for a time the further emission of the steam from it, at that very point of its stroke when its action on the crank is most advantageous. Here, then, is a most fertile source of loss of power, and one which the writer maintains does exist in every locomotive engine so constructed, although it seems hitherto to have been wholly overlooked. Of the disadvantages of a cranked axle, *per se*, it is unecessary to speak, as they are generally acknowledged; but in so far as the effect of the engine is concerned, the writer conceives friction to be the greatest.

On the Stockton and Darlington Railway, the description of engine above animadverted upon, and which is in that district called, by way of distinction, "*the Fire-box Engine*," is the only one used for the first-class trains. For the merchandise trains, engines of a different construction are used; and of these, at least so far as the boiler is concerned, there are only two varieties, viz. the old returning tube boiler, and the returning multitubular. Of the first of these the writer needs to say but little, as it is not well adapted either for quick travelling or burning coke; but where coal is used, as it is on the above-named railway, they possess many advantages for the purposes to which they are applied. The most remarkable, is the facility with which they admit of being repaired; for when the surface of the tube or flue immediately over the fire is worn out, which generally takes place in about eight or ten months, owing to the very intense heat to which it is subjected, the tube may be taken out, and a new, or repaired one, substituted for it in *a day*; and as the other parts seldom require to be repaired, such an engine as this is kept almost constantly at work. They are by no means so extravagant in their consumption of fuel as is generally supposed, the flue being about thirty feet long. The other description of engine is one which the writer is fully convinced is greatly superior to the fire-box plan in every respect: it consists, like the one just mentioned, of a simple cylindrical boiler, fourteen feet long, by four feet four inches in diameter. The fire is made in, and passes through an iron tube or flue, from which the flame and heated gases are *returned* to the smoke-box, by about seventy-five copper or brass tubes of two inches in diameter. In generating steam with *rapidity*, and in *economy of fuel*, they surpass the fire-box plan, and from the circumstance of the fire-tube being of greater diameter, and the draft less, than in the former case,

they are well adapted for burning coke: they are also less subject to *prime*, owing to the tubes not being so much in a body as in a fire-box boiler, and are less exposed to the injurious effects of unequal expansion; which last may be easily explained as follows:—The tubes not being in any way connected with the external shell of the boiler, but with the fire-tube, and this tube being of iron, whilst the small tubes are of course of copper; it is evident, owing to the expansion of iron being less than that of copper, in the proportion of two to one, that the expansion of the two, *i.e.* of the fire-tube and copper tubes, will be nearly equalised, owing to the fire-tube being exposed to a *greater* degree of heat, than that to which the copper tubes are subjected; this will appear evident at first sight, when the arrangement of the boiler is considered. It is also a circumstance worthy of remark, that the *pipe-ends* being so far removed from the *first* and *intense* action of the *fire*, are almost completely protected from its destructive influence. The very construction of this form of boiler at once accounts for its extraordinary durability. The writer has seen several engines on this plan at work, after having had their tubes in for about six years; and when a new fire-tube is required, the practice is to make the new one a little shorter than the old, so as to allow of the old copper tubes being used again, which, from the state they are in, can generally be done. The writer may here observe, that he gives a decided preference to *copper* over brass, for the tubes, on the ground that copper is less brittle under the hammer than brass; he has seen copper tubes which had been in use in a *fire-box* engine for two years, and which were very little the worse, except at the ends, which arose from the frequent caulking they had undergone; and this he believes to be as much as can be said in favour of the durability of brass tubes.

The price of an engine such as above described, having 14 inch cylinders, and weighing about 11 tons, is 1,000*l.*, whilst a fire-box engine costs from 1,500*l.* to 1,600*l.*

Admitting the foregoing statements to be correct—and the writer confidently believes that they cannot be proved otherwise in the main—what a field yet remains to be cultivated in this department of mechanical science; but it is not so much a scientific as a commercial question—a question of profit and loss; one which closely bears upon the prosperity of many railway speculations, which the public at present look upon as doubtful; and should this pamphlet only have the effect of assisting to direct the attention of those whom it so intimately concerns to the subject, the writer feels that he shall have acquired an honour, of which he may well be proud; as the subject is one of great interest, and one in which, in a scientific point of view, he feels a deep interest.

In conclusion, the writer embraces this opportunity to state, that he has hit upon an *arrangement* for the construction of locomotive engines, which he is sanguine enough to believe will effect in an *eminent degree* the following important advantages, viz. *economy in first cost, economy in fuel, increased durability*, and *facility of repair*, accompanied at the same time with *increased efficiency*.

Notwithstanding the writer is well aware that he cannot bring forward any improvement on this, or indeed in almost anything else, single handed, and that it is extremely difficult to obtain attention under such circumstances, yet he does not consider that he would be doing justice to himself, were he to lay before the public a full description of the above-named plan at present; for should it ever be found to possess any real merit, he believes that he alone is entitled to it. The plan is very simple, but it should not be forgotten, that such was the case with the greatest improvement which the history of the steam engine records—viz. James Watt's idea of a separate condensation.

BIOGRAPHICAL NOTICE OF THE LATE MR. WILLIAM HAZLEDINE, IRON FOUNDER AND CONTRACTOR FOR PUBLIC WORKS.

(From the Shrewsbury Chronicle.)

With deep and sincere sorrow we record the death of our respected and endeared townsman, the eminent iron-founder, William Hazledine, on Sunday, October 26, at his house in Dogpole, in the 77th year of his age.

It would be almost criminal to permit such a man to drop into the grave like an ordinary human being, and therefore we hastily present a few incidents in his busy and honourable career through life.

William Hazledine was born at Shawbury, and his parents removed, while he was very young, to a house at Sowbatch, near a Forge at Moreton Corbet, now Moreton Mill, about seven miles from this town. His father was certainly not wealthy; but his ancestors were highly respectable, their remains occupying tombs in the church-yards of Shawbury and Moreton Corbet; and these tombs the deceased, with filial regard, caused to be repaired a few years ago; he also presented two handsomely carved oak chairs for the altars of both those churches.

During sixteen or seventeen of his early years he worked around the vicinity as an operative millwright. His uncle, under whom he was chiefly brought up, was a man of considerable ability as a millwright and engineer; and, discerning the steadiness and talent of his nephew, he recommended young Hazledine, only 16 or 17 years old,

to superintend the erection of machinery at Upton Forge, the property of the Sundorne Family: this was executed most satisfactorily. He afterwards became the tenant of this forge, and the farm belonging to it, and so continued in after life.

After the patronage of his uncle he removed to Shrewsbury, and entered into partnership with Mr. Webster, in Mardol, then a clockmaker, but afterwards an ironmonger and the patentee of a washing-machine. Their first foundry was in Cole-hall, or Knucking-street, in this town; but the speculative and energetic mind of Hazledine having increased the business, more space for workshops, and an increased expenditure for that purpose, amounting to about 2,000*l.*, were necessary: his partner being cautious and timid, a dissolution of partnership took place.

Mr. Hazledine purchased the ground in Coleham, where his present foundry is situated, which has now four gables fronting the road. He prudently first erected one workshop, which occupied only one of these gables; but as business increased he extended his shops, and numerous other erections in the vicinity. He subsequently occupied a foundry near Ruabon, iron works at Calcott, lime works at Llanymynech, timber yards, brick yards, and coal wharfs, in various places.

About this time Billingsley iron mines, near Bridgnorth, were offered for sale in Chancery. Hazledine attended the sale in London, and found there was some jockeyship employed to depreciate the property, and prevent the sale, certain parties being anxious to purchase the works without any competition. Hazledine's sagacity saw the trick; he bid with spirit: at length one of the parties, who wanted to purchase, came to him, and whispered—

"Do you know what you are doing? These mines and works have not a good title, and you will have to pay the expenses in Chancery if you purchase them."

In an audible voice Hazledine answered—

"A bad title to the property, is it, eh? and a Chancery suit, too, eh? Well, I have bought many things, and I will now try to buy a Chancery suit."

He did purchase the property, but immediately sold it, gaining several thousand pounds. The property finally turned out ruinous to the speculators.

In November, 1804, at midnight, a fire took place in a room which was the receptacle for his patterns for castings. Mr. Hazledine was from home, but his wife (a daughter of Mr. Brayne, of Ternhill), an uncommonly strong-minded woman, heard the cry of "Fire in Hazledine's foundry," whilst in bed with her infants, and, immediately getting up, gave directions for saving the books, papers, and other valuables, which caused their rescue from the flames, whilst a vast quantity of other property was consumed with the building. Mr. Hazledine was then the captain of a company of volunteers; and his company, comprising chiefly his own workmen, was merrily called "The Vulcans." The colonel, Sir Charles Oakely, Bart., and the whole corps, were roused, and much property was saved. It was estimated that the loss was 1,500*l.*, and that about two-thirds were covered by insurance.

Undaunted by the calamity, he rebuilt and extended his foundry, and carried on his various speculations, above enumerated, with great energy. Thomas Telford, who in after-life became the celebrated engineer, had been patronised by Sir William Pulteney, and employed in reconstructing some parts of "The Castle" in Shrewsbury, became acquainted with Hazledine, and these kindred spirits formed an intimacy which lasted through life.

Telford soon after was engaged in constructing the Ellesmere and Chester Canal, and Mr. Hazledine became the contractor for the Chirk and Pontycyssylte Aqueducts, the latter being one of the most magnificent works of the kind in Europe, which he completed so entirely to the satisfaction of Mr. Telford and the proprietors, that he was immediately engaged in all the national works in which the Government at that time plunged. The erection of the stupendous locks on the Caledonian Canal was entrusted to him, and executed to the entire satisfaction of the engineer and the country.

Hazledine's fame was now established, and he was employed in a series of great works. The following is a summary:—

Pontycyssylte cast-iron Aqueduct over the river Dee, and the valley at Llangollen, in 1802.

A Bridge, 150 feet cast-iron, over the river Bonar, in Scotland.

A Bridge, 150 feet ditto ditto, over the river Spey, in Scotland.

The Lock-gates on the Caledonian Canal.

The beautiful Waterloo Bridge, 105 feet span, near Bettws-y-Coed, on the Holyhead road.

The iron Swivel Bridges at Liverpool Docks.

The Liverpool New Market Columns.

A Bridge, 150 feet span of one arch, and two arches of 105 feet, over the river Esk, near Carlisle.

The Menai Suspension Chain Bridge.

The Conway Suspension Chain Bridge.

The Iron Roofs for the Dublin Custom House and Store-houses.

The Iron Roofs for Pembroke Stores, &c.

Many Swivel Bridges for Sweden.

A large quantity of three-feet Pipes for India, Demerara, &c.

A Bridge built for Earl Grosvenor, 150 feet, at Eaton Hall.

A Bridge over the Severn at Tewkesbury, 170 feet span.

A new Bridge over the Dee, 105 feet span.

A Bridge for Earl Morley, at Plymouth, comprising five arches, of 100 feet, 96, and 81 feet span.

A Bridge at Bath.

Holt Fleet Bridge, 150 feet, over the Severn, near Worcester.

The Swivel Bridges at the London Docks.

The Marlow Chain Bridge.

Montrose Chain Bridge.

Several small Iron Bridges in this county, and many others all over the kingdom, besides the Lock-gates on the Ellesmere and other Canals.

At the present moment, Hazledine's foundry is executing a very extensive work, namely, several pairs of iron lock-gates for Newport, in Monmouthshire, South Wales, each pair weighing 120 tons, the largest ever executed.

In 1832, when the present Queen, then Princess Victoria, and her august mother, the Duchess of Kent, honoured the Earl of Liverpool with a visit at Pitchford Park, near this town, Mr. Hazledine had the honour of receiving, through the Earl of Liverpool, the commands of the Royal personages to wait upon them at Pitchford Park, and explain the principles and construction of the Menai Suspension Bridge—Hazledine's greatest work. The Royal Party expressed great satisfaction at the lucid and instructive manner in which the explanations were given, and the tact and shrewdness displayed in Mr. Hazledine's answers. Persons who were present describe the interview as most interesting. Mr. Hazledine received a present as a token of approbation; and we cannot avoid adding, from personal knowledge, that her Royal Highness the Duchess of Kent, when she passed over the Menai Bridge, examined every part of it minutely, according to Mr. Hazledine's description, and even entered the caves in which the iron suspension cables are fixed.

This is a slight view of Mr. Hazledine's public works, and it gives a portrait of him as a practical man. There are other features, which we are unable to paint with the warmth and fidelity which they deserve. His strong affection for the members of his family rendered his fireside one of the most happy round which an English family ever gathered. He was ever devising some simple means of increasing their enjoyments; and he attended personally to everything in which their comforts were involved. At that trying season, when the wheel of the "Union" coach locked into that of his gig on the Wyle Cop, and overthrew him and shattered his arm in several places, and he was carried home in such plight as threw his affectionate wife into such agony as deprived her of life by a disorder arising from the grief she suffered from his illness—even in that accumulation of sorrows his presence of mind and affectionate care never for a moment ceased; and whilst his face was suffused with sweat from the extreme agony he was suffering from the bone of his arm having to be *again* broken by the surgeon—even then he took upon himself the whole preparation for the funeral of his beloved wife, down to the minutest fittings up of the coffin and funeral clothes; and what all his own sufferings could not wring from him, he gave way to with the utmost bitterness when the dead body of her he so much loved was carried into his chamber, that he might kiss it before it was for ever removed from his sight!

As a master he was kind and considerate to all employed under him; his workmen, if they conducted themselves well, became grey, and died in his service. In our obituary last month we recorded the death of John Maybrey, sen., who had been upwards of 40 years in the employment of Mr. Hazledine, who, indeed, reminds us of Addison's character of Sir Roger de Coverley:—"You see the goodness of the master even in the house-dog, and in his *grey horse*, that is kept in the stable with great care and tenderness, out of regard to his past services, though he has been useless several years."

The religion of Hazledine was also somewhat characterised by Addison:—"Nothing is so glorious in the eyes of mankind, and ornamental to human nature — setting aside the infinite advantages which arise from it—as a strong, steady, masculine piety; but Enthusiasm and Superstition are the weaknesses of human reason—that expose us to the scorn and derision of Infidels, and sink us even below the beasts that perish."

A very short time before he was confined to bed by his last illness, a nobleman, equally distinguished by his literary and legal talents, and filling one of the highest situations which a subject can occupy, arrived in the town, at a little before seven in the morning, and inquired at the Lion if Mr. Hazledine was likely to be up?

"Oh yes," was the reply; "he passed here an hour and a half ago, on his way to the foundry."

"I regret that," said his lordship, "for I wanted a few minutes' conversation with him, which I cannot now have; but tell him from me, that Lord —— inquired after him, and is happy to hear he is so well. My belief is," added his lordship, "that William Hazledine is the first practical man in Europe."

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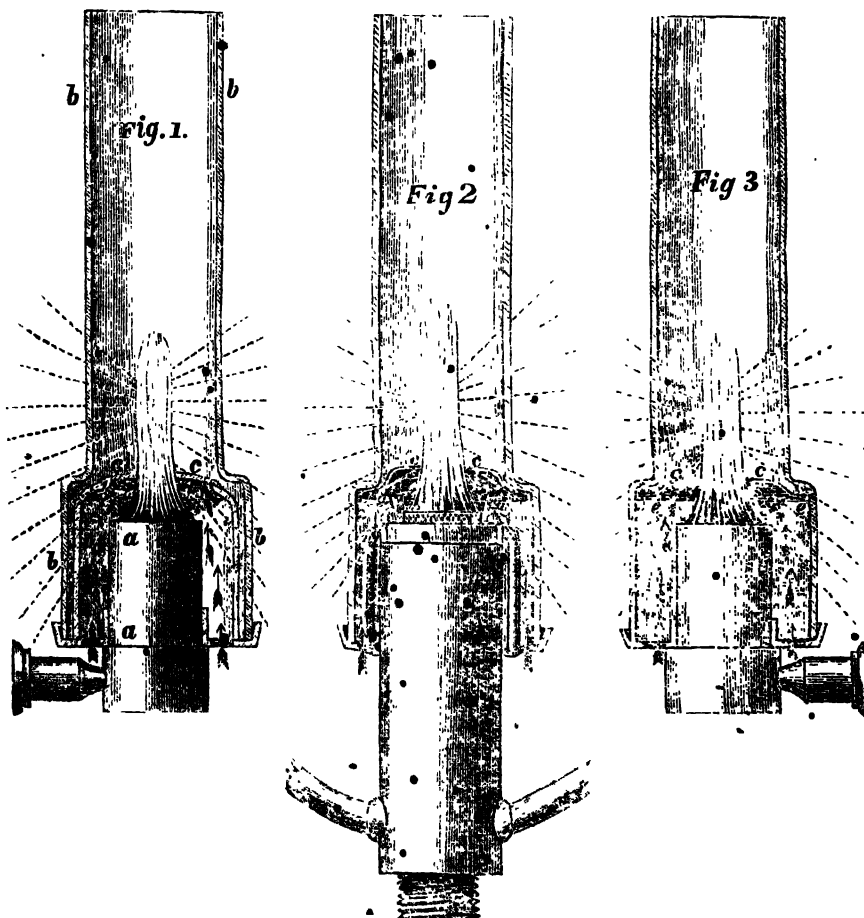
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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SMITH'S PATENT IMPROVEMENTS IN SOLAR LAMPS.



SMITH'S PATENT IMPROVEMENTS IN SOLAR LAMPS.

Among the numerous class of lamps which are presented for adoption at the present time, the "Solar Lamp" is one of the most popular, from the circumstance of its producing a brilliant light even when consuming common or low priced oils.

The invention of the "Solar Lamp" is due to Mr. Jeremiah Bynner, of Birmingham, by whom it was patented in 1837. The peculiarity of this lamp, which was on Argand's principle, consisted in causing the air supplied on the outside of the cylindrical wick to support combustion, to be forced against the flame in a horizontal direction a little above the point of ignition. In order to accomplish this object Mr. Bynner covered his burner with a cap, having a hole in its apex, rather smaller in diameter than the cotton wick, for the flame to pass through. Air was admitted to the interior of the wick in the usual manner, but that on the outside passed up between the lamp and the cap or covering, and was thereby deflected and made to impinge upon the flame in a horizontal direction: the effect of this was that the flame was contracted so as to pass through the diminished aperture that is presented to it, while the whole of the air being brought into immediate contact with the flame and all the carbonaceous matters decomposed, the combustion was rendered exceedingly perfect and the light of the most vivid character. This cap, covering, or deflector, being wholly of metal, concealed all the lower portion of the flame, and intercepted a quantity of the rays of light which would otherwise have been available in aid of its illuminating power.

The present invention has for its object certain modes of constructing and applying deflectors, whereby in addition to obtaining all the benefit hitherto derived from the use of such deflectors, so much of the flame as is below the deflector will be uncovered.

The engravings on our front page show three methods which Mr. Smith has described for accomplishing this object.

Fig. 1 represents an ordinary Argand gas burner *a*, having a glass chimney *b*, supported on a gallery in the usual manner; *c* is the deflector, the lower part of which is of glass, having the upper or deflecting surface of brass or other suitable metal. The arrows indicate the direction of the air which supports the combustion of the flame externally; it will be seen that the diameter of the opening in the deflector through which the flame passes, is materially less than the diameter of the upper part of the chimney, and it will be evident that the air as it rises up the interior of the deflector, will be deflected in towards the flame with a tendency to pass in a nearly horizontal direction through it, producing perfect combustion and a brilliant light; with the additional advantage of obtaining and making available the light of so much of the flame as is below the deflector, and which was formerly hid, or covered by it.

Fig. 2 shows the burner, &c. of an Argand oil lamp, fitted with a deflector of a different construction. In this instance the deflector is supported by a wire frame or supports *d d*, in connection with the gallery for the glass chimney. By this arrangement the deflector *c* will be supported within the glass chimney, and will for the most part intercept the air passing up within the chimney and cause it to strike against the flame in the same manner as the foregoing, and with similar advantages.

Fig. 3 is another Argand gas burner, fitted with a deflector *c* in a different manner; in this case the deflector is simply a plate of metal fitting the lower part of the glass chimney, and held in its place by an annular spring, or expanding hoop or ring *e*.

In all these cases the draught caused by the tall glass chimney causes a current of air to rush up against the deflector, which is thereby directed against the flame with such force as to produce the effects stated, while at the same time there is no obstruction presented to the free passage of the light in all directions.

JACK FROST'S VAGARIES.

Sir,—On "leaving home" this morning (Saturday) I was exceedingly amused with the effects of a heavy fall of hoar frost that had descended during the night.

I am aware that the many beautiful configurations, which the particles of congealed vapour assume, have been extensively noticed, and they will doubtless form the subjects of wonder and admiration, to the end of time; but I observed a peculiarity, that had not before attracted my attention, nor do I remember ever having seen it noticed in any publication. I allude to a species of polar arrangement of the particles of the hoar frost on all the prominent lines and ridges of various objects, especially of iron railings. The square perpendicular rails were "fledged with icy feathers" having a feathery tuft radiating from each of their four angles, while the plain flat surface was nearly free from any deposit; the javelin-like heads of the rails, had the edges of the outline, and the central rib or ribs, most accurately depicted by strong white lines, formed by the accumulation and radiation of the beautifully-formed tufts of frost. Where the railings were of a more ornamental character, as the iron supports, &c. of the gates at Christ Church, Blackfriars' Road, the appearance was proportionally heightened, and nothing could exceed the truth and elegance with which every projecting line of the rails, rings, flowers, &c. was picked out in "Nature's purest white."

I could not find any satisfactory instance of a similar arrangement on surfaces of *wood*, but on the stone-parapet walls of the "new" Blackfriars' Bridge, I found abundant proofs that the phenomenon was by no means confined to metal. The little ridges left by the mason's chisel had each on its apex a perfect row of "the icy vegetation," presenting a pleasing miniature resemblance to the "herb-crowned ridges" of a well ploughed field.

Whether the singular disposition of these particles of frost, is to be rightly attributed (as I am inclined to think,) to the laws of crystalline arrangement, or if it be a consequence of electric or magnetic influence, I know not, and shall be glad to hear the opinion of other of your correspondents who may chance to have noticed the phenomena. As far as I had an opportunity of observing, the deposition and arrangement was somewhat less perfect on those surfaces which faced the north, but not invariably so.

Whatever may be the cause, the effect is altogether unique, strongly reminding us of some lines of Cowper's—

> "Thus Nature works as if to mock at art,
> And in defiance of her rival powers;
> By these fortuitous and random strokes
> Performing such inimitable feats,
> As she with all her rule, can never reach."

I am, Sir, yours respectfully,

Wm. Baddeley.

London, January 9, 1841.

HAWKINS' EVERLASTING PENS.

Sir,—Some of your correspondents seem anxious to know something about Hawkins' Everlasting Pens. I procured one from London a short time ago, for which I paid twenty shillings, and since then I have sent for a holder, which will be five shillings more; the pen writes very well, that is to say, as well as metallic pens generally do, but is subject to the same imperfection of being occasionally caught in the paper and spurting the ink over it. Of course I can say nothing respecting their durability, which, in my opinion, constitutes the only advantage which they possess over the steel pen; but taking Mr. Hawkins' own estimate on that point, I nevertheless think them very dear. Before he can hope to see them in universal use, he must reduce the price of them to something like one-half of the present charge.

P. O. P.

January 6, 1841.

THE SUPERIORITY OF CORNISH SINGLE LIFTING ENGINES OVER ROTATIVE.

Sir,—Can "Nauticus" or other correspondents furnish tables of the performances of Mr. Cunard's magnificent steamers, the *Arcadia, Britannia, Caledonia,* and *Columbia*, or of any other steam ships, passage boats, or tugs? I want accurate returns as nearly similar to the annexed form as I can get them, before I can go completely into the subject of the superiority of Cornish engines over rotative. I prefer having these facts through your columns, because unless data are established which all will admit, discussion were endless and useless. When too it is well ascertained what the

difference in consumption really is, we can better determine whether the causes already assigned are sufficient, for I need scarcely say that every effect must have an adequate cause. If engineers, or the proprietors of steam vessels, would make such returns, I have no doubt a surprising progressive improvement in marine engines would be observed, where it is of far more importance for long sea voyages than in Cornish engines. It is owing to the publication of such reports, the openness to enquiry, and the handsome facilities given for their verification, that the Cornish engines have so progressed in duty that the saving in fuel compared with the average consumption in 1814, is, at 17*s.* per ton, £84,300 per annum.

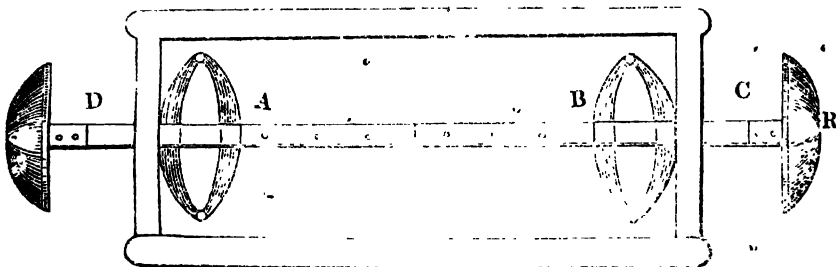
I am, Sir, your obedient servant,

SCALPEL.

January 12, 1841.

Name.	Diameter of Cylinder.	No. of Strokes.	Length of Stroke.	Cut off at.	Pressure in Boiler.	Consumption of fuel.	Reputed power.

IMPROVED SPRING BUFFERS FOR RAILWAY CARRIAGES.



Sir,—I had intended to send you a description of a model I made a few years back for the inspection of railway companies, but I have delayed it so long, that most of my ideas have been embodied in the published plans of other parties. I merely wish to mention, therefore, that the object I had in view was to transmit the effects of a concussion to the farthest end of the carriage; which I proposed to accomplish, in the manner shown by the accompanying sketch of the lower framing of a railway carriage. A B is a solid bar of wood bolted between two iron straps, extending from spring to spring, with the spaces A D and B C left open. It will be seen that a blow at R would be transmitted to the spring at the farthest end of the carriage, by which, I apprehend, the tendency of the blow to throw the carriage off the rails would be very greatly diminished.

I am, Sir, your obedient servant,

J. WALKER.

Crooked Lane, December 26, 1840.

THE UTILITY OF A LEAD IN THE SLIDE VALVES OF LOCOMOTIVE ENGINES, QUESTIONED.

Sir, — Your correspondent, Mr. C. Pearce, has been at considerable pains (No. 976, p. 573) in endeavouring to prove that a sliding valve may be made to work an engine either way with an immoveable eccentric, but if he will reconsider his plan, and *reverse* the position of his piston in the diagram, fig. 2, p. 575, it will not be difficult for him to see the futility of it—in fact, whatever might be the amount of lead or advance which the slide would have in the position there shown, it would be just as much in *arrear* at the opposite end of the stroke, and consequently, worse than if it were placed at half stroke, with the crank on the centre. Setting the expansive principle aside, will Mr. Pearce, or any of your correspondents favour me with a reason why a slide should have

any lead or advance, because, if no very satisfactory reason can be assigned for it, there is equally as little for one moveable, or two fixed eccentrics to each engine to cause it. I must confess my inability to see any advantage in it, to compensate for the increased number of parts, and complexity of the machinery required for it.

I am, Sir, yours respectfully,

P. O. P.

Jan. 6, 1841.

FIRE-ESCAPES—SAFETY MATTRASSES ON BOARD SHIPS—LITHOGRAPHIC ENGRAVING.

Sir,—The objections to our numerous fire escapes, are that they are never ready when wanted, or out of order, or cumbersome, or too complex, with the exception of the simple rope and snatch hook, which might be greatly improved by substituting an iron hook to one end, which after passing the rope round the waist, might be inserted into an iron ring at a convenient distance, and thus serve the purposes of the belt. Allow me therefore to lay before your readers, one that has not hitherto been noticed, and which embraces other uses, is always ready, not very expensive, and consists of an iron ladder, painted of the colour of the wall, and fastened by clamps to the back part of the house, passing to the sides of the windows, and reaching from the bottom, to the roof of the building, but folded up at bottom for bout 8 feet, by a hinge and bolted, and the same at the top for about four feet only, so that a person ascending can throw it up to the parapet. By this means, whilst it is secured from intruders, at both ends, it can easily be made available to workmen to mend the roof, and will last as long as the walls endure, if it is composed of inch-iron rod. At each window a little below the sill, there is a staple or stop to assist in getting out of the window. Its projection from the wall of the house is only six inches, to give room for the foot, and the expence is not equal to any common ladder of like length. In repairing the roofing much money would be saved by it, and much time, and ultimately it is worth its weight in iron. Such perpendicular ladders are used in mines, and in warehouses in Italy.

Now permit me to add a word on a very different object, but which also relates to the protection of life. I would ask masters of steamers and packets, why they do not furnish their births with mattresses stuffed with cork shavings, or use raspings of that material, instead of wool, which might be the means of saving the lives of many passengers, as by having cords at the corners they might quickly be united, and formed into a flexible raft—a description of which will be found, and its uses, and origin, communicated by the author of this letter in Nicholson's journal for 1810, page 134?

To set up such a manufactory nothing is wanting, but a rasping mill, some waterproof canvas, and a few active sempstresses—for the invention has long been given to the public, and all the refuse of the cork cutters would be available for this purpose, being an article in scarce any estimation.

My next question is, what is the reason artists do not take their images from the common camera, or Storer's invaluable delineator, directly on lithographic stone, instead of paper; as the impression from the stone would then come off right, and for many subjects this method would be advantageous in point of expedition and correctness, especially as to proportion in buildings, perspective, and such small objects, as require precision, viz.: fossils, shells, gems, crystals, or flowers of remarkable character?

By stirring such questions as these, we promote useful enquiries, and sometimes anticipate latent discoveries.

I am, Sir, yours, &c.

G. CUMBERLAND, Sen.

Bristol, January 12, 1841.

THE "NEW THEORY OF THE UNIVERSE."

Sir,—I cannot regret a want of precision which has called forth such useful observations from R. C., especially as the subject in question forms a very interesting portion of my theory. Instead of saying, "We know that currents of heat flow from the equator north and south," I ought to have said, "I presume that currents of solar fluid flow northward and southward from the torrid zone, slightly varied in their pro-

gress by the position of the sun and other obstructions on the surface of the globe." This error shows the necessity for "exact terms." Would *planetary fluid* be a good designation, as in the subjoined table? I will adopt it for the present.

Respecting the Temperature of the Polar Regions.—I regard the solar fluid as a foreign fluid which, however serviceable during its passage, preserves its identity while pursuing its course to the polar regions where, at the union of its currents, it evaporates or explodes and, according to the density or reflecting power of the superincumbent atmosphere, produces those corruscations of light which we now call Aurora Borealis. The intensity of heat when the sun is vertical is occasioned by the accumulation of solar fluid from the greater difficulty which it necessarily encounters in changing its direction. This accumulation of solar fluid would impede the ascent of the planetary fluid and the descent of the firmamental fluid, if the contention of the three fluids did not produce frequent rain and thus produce that state of temperature which is needful for vegetable and animal existence. We find accordingly, except when relieved by the vicinity of mountains, the most arid lands on the exterior margins of the torrid zone, when the contention of the fluids not being sufficient to produce rain, the solar and planetary fluids exert too strong an influence and all is desert. Compensation is a remarkable law in nature but there must be limits! Why may not the exterior margins of the Arctic and Antarctic circles be more frigid than the immediate polar region with their meetings of solar fluid? The polar regions are also depressed, another cause for the accumulation of heat during their long summers. The further remarks or inquiries of R. C. will be esteemed a favor.

I remain, Sir,
Your obliged,
E. A. M.

January 7, 1841.

Postscript.

With respect to absorption on the entrance of the firmamental fluid into the earth, I regard it as the cause of *gravity*, being always in proportion to the quantity of matter which impedes the approach of the firmamental fluid to the earth. Why should two bodies in firmamental fluid approach each other? The reason is plain enough, if one absorbs the firmamental fluid. This reason would not be good if the planetary fluid repulsion were equally powerful with that of the firmamental pressure, but this force, radiating from unequal altitudes, from the wing of the eagle to the sea-weed of the ocean, loses its power of repulsion at the surface of the earth to a certain degree, and produces those traversing fluids, within the atmosphere, which cause the approachment of matter (*without* absorption) which is called *attraction*. Every blade of grass, every insect, lends its power to the circulation of the fluids of the Universe. Nothing is in vain in the works of the Great First Cause.

E. A. M.

January 8, 1841.

TABLE.

Positive Cold.	Positive Heat.				*Remarks.*
Universal or Firmamental Fluid.	Planetary Fluids.	Solar fluid. Mercury Venus The Earth &c.	Moon Fluid or Fluid of the	Earth, Moon, &c.	All these different heats preserve their identities until ultimately condensed into the Firmamental Fluid.
	Stella Fluids.				
	Comet Meteoric Fluids.				

ON PLANE METALLIC SURFACES, AND THE PROPER MODE OF PREPARING THEM; READ AT THE MEETING OF THE BRITISH ASSOCIATION, AT GLASGOW, A.D. 1840, BY JOSEPH WHITWORTH, ESQ.

The surface plates now exhibited are remarkable both for the high degree of truth they possess, and for the mode adopted in preparing them.

If one of them be carefully slided on the other, to exclude the air, the two plates will adhere together with considerable force, by the pressure of the atmosphere. The surfaces should be well rubbed previously, with a dry cloth, till they are perfectly free from moisture, that the experiment may afford a fair test of accuracy. If any moisture be present it will act like glue, and would cause adhesion to take place, supposing the surfaces to be much inferior. But if they be perfectly dry, adhesion proves a high degree of truth rarely attained.

The experiment may be varied, by letting one surface descend slowly on the other, and thus allowing a stratum of air to form between them. Before they come into contact, the upper plate will become buoyant, and will float on the air without support from the hand.* This remarkable effect would seem to depend on the close approximation of the two surfaces at all points, without contact in any - a condition which could not be obtained without extreme accuracy in both. The escape of the remaining portion of air is retarded by friction against the surfaces, the force of which nearly balances the pressure of the upper plate. If one end of the upper plate be slightly raised and allowed to fall suddenly, the intervening air will act like a cushion, causing a muffled sound to be emitted, quite different from that produced by the concussion of metallic bodies.

These surfaces were brought to their present state by means of filing and scraping, without being afterwards ground. The method hitherto adopted in getting up plane surfaces has been (after filing to the straight edge) to grind them together with emery. In some cases it has been customary to try them previously on a surface plate, and to go over them with the scraping tool, but they have always been ground afterwards. The surface plate itself has been invariably treated in the same manner. The process of grinding is, in fact, regarded as indispensable wherever truth is required. The present examples, however, show that scraping is calculated to produce a higher degree of truth than has ever been attained by grinding. In reference to both processes a great degree of misconception prevails, the effect of which is materially to retard the progress of improvement, and which it is of great importance to remove. While grinding is universally regarded as indispensable to a finished surface, it is, in fact, positively detrimental. On the other hand, the operation of scraping, hitherto so much neglected, constitutes the only certain means we possess for the attainment of extreme accuracy. A few remarks will clearly illustrate the truth of this statement.

It is required in a surface for mechanical purposes, that all the bearing points should be in the same plane—that they should be at equal distances from one another—and that they should be sufficiently numerous for the particular application intended. Where surfaces remain fixed together, the bearing points may, without disadvantage, be fewer in number, and, consequently, wider apart; but in the case of sliding surfaces, the points should be numerous and close together.

A little consideration will make it evident that these conditions cannot be obtained by the process of grinding. And, first, with regard to general outline, how is the original error to be got rid of? Let it be supposed that one of the surfaces is concave, and the other a true plane. The tendency of grinding, no doubt, will be to reduce the error of the former, but the opposite error will, at the same time, be created in the true surface. The only case in which an original error could be extirpated would be, when it was met by a corresponding error of exactly the same amount, in the opposed surface, and the one destroyed the other. But it is evident, that where only two surfaces are concerned, the variety of error in the general outline is not sufficient to afford any probability of mutual compensation.

It will further appear, that if the original error be inconsiderable, the surfaces must lose instead of gaining truth. It results from the nature of the process, that certain parts are acted upon for a longer time than others. They are consequently more worn, and the surfaces are made hollow. Nor is there any possibility of obviating this source of error, except by sliding one surface entirely on and off the other at each move—a method which, it need not be shown, would be impracticable.

It may be mentioned, as an additional cause of error, that the grinding powder collects in greater quantity about the edges of the metal than upon the interior parts, producing the well-known effect of the bell-mouthed form. This is particularly objectionable in the case of slides, from the access afforded to particles of dirt, and the immediate injury thereby occasioned.

* The surface plates referred to were 14 in. by 9 in., weighing 49 lbs. each. When smaller plates are used, one being held in each hand, and both slided on the air between them, a very peculiar sensation will be experienced.

Another circumstance materially affecting the durability of ground slides is, that a portion of the emery becomes fixed in the pores of the metal, causing a rapid and irregular wear of the surfaces.

If grinding be not adapted to form a true general outline, neither is it to produce accuracy in the minuter detail. There can be little chance of a multitude of points being brought to bear, and distributed equally, under a process from which all particular management is excluded. To obtain any such result, it is necessary to possess the means of operating independently on each point, as occasion may require; whereas grinding affects all simultaneously. It is subject neither to observation nor controul. There is no opportunity of regulating the distribution of the powder, or of modifying its application, with reference to the particular condition of different parts of the surface. The variation in the quantity of the powder, and the quality of the metal, will, of necessity, produce inequalities, even supposing they did not previously exist. Hence, if a ground surface be examined, the bearing points will be found lying together in irregular masses, with extensive cavities intervening. An appearance, indeed, of beautiful regularity is produced, and hence, no doubt, the universal prejudice so long established in favour of the process. But this appearance, so far from being any evidence of truth, serves only to conceal error. Under this disguise, surfaces pass without examination, which, if unground, would be at once rejected.

Another evil of grinding is, that it takes from the mechanic all sense of responsibility, and all spirit of emulation, while it deludes him with the idea that the surface will be ultimately ground true. The natural consequence is, that he slurs it over, trusting to the effect of grinding, and well knowing that it will efface all evidence either of care or neglect on his part.

It thus appears that the practice of grinding has altogether impeded the progress of improvement. A true surface, instead of being, as it ought, in common use, is almost unknown: few mechanics have any distinct knowledge of the method to be pursued for obtaining it; nor do practical men sufficiently advert, either to the immense importance, or to the comparative facility of the acquisition.

Due latitude must be allowed the expression "true surface." Absolute truth is confessedly unattainable. Moreover, it would be possible to aim at a degree of perfection beyond the necessity of the particular case, the difficulty of which would more than counterbalance the advantage. But it is certain that the progress hitherto made falls far short of this practical limit, and that considerations of economy alone, would carry improvement many degrees higher. The want of it in various departments of the arts and manufactures is already sensible. The valves of steam-engines, for example;—the tables of printing presses—stereotype plates—surface plates—slides of all kinds, require a degree of truth much superior to that they generally possess. In these and a multitude of other instances, the want of truth is attended with serious evils.—In the case of the slide-valves of steam-engines, there is occasioned a great loss of steam power and also an immense increase of wear and tear.*—In stereotype printing, inaccuracy of the plates renders packing necessary to obtain an uniform impression. A vast amount of time and labour is thus sacrificed, and the end is, after all, but imperfectly attained,

The extensive class of machinery, denominated tools, affords an important application of the subject. Here every consideration combines to enforce accuracy. It is implied in the very name of the planing engine. The express purpose of the machine is to produce true surfaces, and it is itself constructed of slides, according to the truth of which will be that of the work performed. When it is considered that the lathe and the planing engine are used in the making of all other machines, and are continually re-producing surfaces similar to their own, it will manifestly appear of the first importance that they should themselves be perfect models.

There is, perhaps, no description of machinery which would not afford an illustration of the importance belonging to truth of surface, and at the same time of the present necessity for material improvement; nor is there any subject connected with mechanics, the bearings of which, on the public interests, whether manufacturing or scientific, are more varied or more extensive.

The improvement so much to be desired will speedily follow upon the discontinuance of grinding. Recourse must then be had to the natural process. The surface plate and the scraping tool will come into constant use, affording the certain and speedy means of attaining any degree of truth, which may be

* Mr. Dewrance, superintendent of the locomotive department of the Liverpool and Manchester Railway, in a letter to Mr. Whitworth, dated the 23rd of December, 1840, says,—"In answer to yours of the 20th instant respecting the difference of the slide-valves got up with emery, and those that are scraped or got up according to your plan, the difference is as follows:—I have this day taken out a pair of valves got up with emery, that have been in constant wear five months, and I find them grooved in the usual way. The deepest grooves are one-eighth of an inch deep, and the whole surface which is eight inches broad, is one-sixteenth hollow or out of truth. Those that were scraped are perfectly true, and likely to work five months longer."

required. A higher standard of excellence will be gradually established, the influence of which will be felt throughout all mechanical operations, while to the mechanic himself a new field will be opened, in which he will find ample scope for the exercise of skill, both manual and mental. The subject will be best illustrated by a description of the process.

There are two cases for consideration, in reference to the preparation of surfaces,—the one, where a true surface plate is already provided, as a model for the work in hand, and the other where an original surface is to be prepared.

The former case is that which will generally occur in practice. And here the method to be pursued is simple, requiring care rather than skill. Colouring matter, such as red ochre and oil, is spread over the surface plate *as equally as possible*. The work in hand, having been previously filed up to the strait edge, is then applied thereto, and moved slightly to fix the colour, which, adhering to the parts in contact, afterwards shows the prominences to be reduced. This operation is frequently repeated, and as the work advances, a smaller quantity of colouring matter is used, till at last, a few particles spread out by the finger suffice for the purpose, forming a thin film over the brightness of the plate. A true surface is thus rendered a test of the greatest nicety, whereby the smallest error may be detected. At this stage of the process, the two surfaces must be well rubbed together, that a full impression may be made by the colour. The higher points on the rising surface become clouded over, while the other parts are left more or less in the shade. The dappled appearance thus produced, shows to the eye of the mechanic, the precise condition of the new surface in every part, and enables him to proceed with confidence in bringing it to correspondence with the original. Before this can be accomplished, however, a scraping tool must be employed, the file not having the precision or nicety requisite to finish the operation. Experience will be a sufficient guide when to exchange the one for the other. It will be found, that when the parts to be operated upon have become to any considerable extent subdivided, scraping is much the more expeditious method. The scraping tool should be made of the best steel, and carefully sharpened to a fine edge on a Turkey-stone, the use of which must be frequently repeated. Worn-out files may be converted into convenient scraping tools. A flat file, with the broad end bent and sharpened, will be most suitable in the first instance, and afterwards a three-sided file sharpened on all the edges. It will be matter of discretion, as before remarked, how far to proceed in working up the minute detail, but it is essential that the bearing points, whether more or less numerous, should be *equally distributed*, and an uniform character preserved throughout. This rule should be carefully observed during the progress of the work, as well as at its conclusion.

In order to secure the equal advance of all the parts together, particular attention must be paid to the colouring matter, both with reference to the quantity employed, and its equal distribution. If too small a quantity be used in the first instance, it will afford no evidence of the general condition of the surface. It will merely indicate the particular points which happen to be most prominent, and to reduce these in detail would be only a waste of time, so long as they are considerably above the general level.

When the surface is finished, if it be rubbed on the plate without colour, the bearing points will become bright, and the observer will be able to judge of the degree of accuracy to which it has been brought. If it be as nearly true as it can be made by the hand, bright points will be seen diffused throughout its whole extent, interspersed with others less luminous, indicating thereby the degree of force with which they respectively bear.

In getting up a surface of considerable extent, it is necessary to take into account the strain which the metal suffers from its own weight, and the length of time required to produce the full effect on the external form. It will be found, for example, that after a piece of metal has remained for some days in one position undisturbed, it assumes a form different from that which it had while undergoing preparation. Hence, it is desirable to provide for the work, while in hand, similar support to what it will have when applied to its intended use.

Another disturbing cause is the unequal contraction of the metal in cooling, when originally cast. The mass assumes the curved form, and is pervaded by elastic forces counteracting each other. These continue in permanent activity, and any portion of metal, taken from any part, tends to disturb the balance previously established.

It remains to consider the second case proposed, viz. how to prepare an original surface. A brief description of the proper method will still further illustrate the case already considered, and will also show how surface plates are to be corrected.

Take three plates of cast iron, of equal size, and proportionate strength. The metal should be of a hard quality. The plates should be well ribbed on the back to prevent springing, and each of them should have three projecting points on which to rest, placed triangularly in the most favourable positions for bearing. The object of this provision is two-fold,—first, to secure

the bearing of three good points, before the plate suffers any strain from its own weight; and,—secondly, to insure the constant bearing of the same points. The plate would otherwise be subject to perpetual variation of form, owing to the irregular strain, occasion by change of bearing. A provision of this kind, is equally necessary while the plate is undergoing the operation of surfacing, and when it is afterwards used as a model.

In fixing the plates on the table of the planing machine, care should be taken to let them bear on the points before mentioned, and to chuck them with as little violence as possible to the natural form, otherwise they will spring on being released, and the labour of filing will be increased in proportion. It is proper also to relax the chucks before taking the last cut. With these precautions, if the machine itself be accurate, and the tool in proper condition, the operation of planing will greatly facilitate the subsequent processes.

The plates are next to be tried by the straight edge, by a skilful use of which a very small degree of inaccuracy may be detected.

Let one of the three plates be now selected as the model, and the others be surfaced to it with the aid of colouring matter. For distinctness they may be called Nos. 1, 2, and 3. When Nos. 2 and 3 have been brought up to No. 1, compare them together. It is evident that if No. 1 be in any degree out of truth, Nos. 2 and 3 will be either both concave, or both convex, and the error will become sensible on comparing them together by the intervention of colour. To bring them to a true plane, equal quantities must be taken in both from corresponding places. When this has been done with all the skill the mechanic may possess, and Nos. 2 and 3 are found to agree, the next step is to get up No. 1 to both, applying it to them in immediate succession, so as to compare the impressions. The art here lies in getting No. 1 between the two, which is the probable direction of the true plane. It is to be presumed that No. 1 is now nearer truth than either of the others, and it is therefore to be again taken as the model, and the operation repeated.

It will be observed that the process now described, includes three parts, and consists in getting up the surfaces to one another in the following order.—

1st. Nos. 2 and 3, to No. 1.

2nd. Nos. 2 and 3 to each other.

3rd. No. 1 to Nos. 2 and 3.

These parts compose an entire series, by repeating which, a gradual approach is made towards absolute truth,—till farther progress is prevented by inherent imperfection.

In the earlier stages, the operation may be greatly expedited by judicious management. It has been already remarked, but it cannot be too often repeated, that the general outline of the surface should be solely regarded in the first instance, and the filling up deferred till after general truth has been secured. By this method the first courses of the series will be short, and the progress made will be both more speedy and more sure, the minuter detail being gradually entered upon, without the risk, otherwise incurred, of losing previous labour. As, however, the surfaces approach perfection, the utmost caution and vigilance will be necessary to prevent them from degenerating. This will inevitably happen, unless the comparison be constantly made between them all.

In the use of the surface plate, care should be taken to prevent unnecessary injury, whether superficial or from straining. It should also be occasionally submitted to careful correction. In no other way can a high standard be steadily maintained.

It will be found convenient to set apart one plate for the purpose of correcting others, allowing it to remain entirely undisturbed. It would otherwise be necessary, at every revision, to repeat the process for obtaining an original surface, and a considerable loss of time would thus be occasioned.

A mistaken idea prevails, that scraping is a dilatory process,* and this prejudice may tend to discourage its introduction. It will be found, however, to involve the sacrifice of less time than is now wasted on grinding. Were the fact otherwise, it would be no argument against the preference due to the former. But it is worthy of observation, that in this instance, as in many others, improvement is combined with economy. There is not only an incalculable saving effected by the improved surface in its various applications, but there is also a positive gain of time in the preparatory process.

ADAPTATION OF CAPTAIN ERICSSON'S TRANSVERSAL PROPELLER TO THE NEW YORK PACKET SHIP "CLARION." †

The much desired combination of the powers of wind and steam, for the navigation of the ocean, will, we have every reason to believe, soon be effected.

Messrs. Russell and Stephen Glover, of this city, known for great knowledge and experience in all matters relating to navigation,

* When grinding was first discontinued in the workshop of Messrs. Whitworth and Co., now about twelve months ago, no mechanic could be induced to take the work on the same terms as before, owing to the supposed extra labour of scraping. But experience has entirely removed this prejudice, and the work is now done with greater dispatch than ever.

† For a description of this invention see *Mech. Mag.* Nos. 721, 751, and 781.

are now trying Capt. Ericsson's Transversal Ship Propeller, to their fast sailing packet ship *Clarion.* The leading feature of this propeller is that of working entirely under water. It consists of two iron hoops to which a series of iron plates of a winding shape are attached; these plates are fixed at an angle of about 45 degrees, and when caused to revolve, propel the ship by acting obliquely against the water, somewhat on the principle of sculling. The iron hoops, with their winding plates or paddles are attached to shafts passing through the run of the ship, one on each side of the stern post.

The steam machinery employed to turn the shafts and propellers, is fixed in the run of the ship, abaft the mizzen-mast, under the lower deck, so that scarcely any stowage room is taken away.

The engines building for the *Clarion* will be equal to 70 horse power. The total weight of the whole machinery will not exceed 20 tons. These engines are of a remarkably simple construction; the crank shafts working close to the bottom of the ship, the heavy frame-work, indispensable in ordinary marine engines is altogether dispensed with.

A powerful pump will also be attached to the engines of the *Clarion*, which may be used either as a fire-engine or for pumping the ship.

The consumption of fuel will not exceed four tons in twenty-four hours, owing to the economical mode of working the steam by expansion which this propeller admits of at all times, whether the sea is rough or smooth. A blower being employed, the chimney will be very small, standing only twelve feet above deck.

Whenever the wind is favourable, it is intended not to use the steam power, in which case the propeller shafts will be detached from the engines, that being effected by simply drawing two bolts. An accurate estimate of the resistance offered by the propellers in revolving freely by the motion of the ship, has established the fact that their drag or retarding effect will not diminish the speed of the ship more than five per cent. whenever that speed exceeds ten miles per hour.

The practical results of having such a considerable independent power on board a ship need hardly be pointed out. On a lee-shore, or in a current, such a ship is always safe; in moderate head winds or calms she proceeds steadily towards her destination; if she springs a leak there is the untiring steam power to keep her dry, with a force exceeding 100 men; if struck by lightning, or her cargo ignited by spontaneous combustion, there is the same energetic power to extinguish the flames by throwing an unlimited quantity of water, but which is pumped back again as soon as it finds its way into the bilge. On making land, a ship provided with this propeller does not require the aid of a steam-tug, and even during the most severe winter her propelling machinery will remain equally efficient, being placed several feet below water line, and thereby protected against ice, and freed from an impediment which renders common paddle-wheels quite useless during severe winter. To this may be added that the pursuit of a hostile man of war, or a pirate, may be disregarded by a captain who has the good fortune of commanding a ship possessing such powerful means for effecting a prompt escape, independent of the capricious agency of the wind.

The increased duty which will be performed by every ship provided with the Transversal Ship Propeller, the great saving effected in pay and maintenance of the crew, the reduced cost in providing for passengers, saving of interest of capital invested in the ship, saving of the interest on a valuable cargo, &c., consequent on making short passages, are advantages which this novel application of steam as an auxiliary will effect, but the amount of which we shall leave to the experienced merchant to estimate. In conclusion, we hail the improvement which the Messrs. Glover are now introducing into our mercantile navy, as being one of national importance; and we predict, that if that success attends the *Clarion* which there is every reason to anticipate, our splendid packet ships will soon resume the proud station which they occupied before the introduction of the British steamers; and we may ere long see American steam-packets constructed to receive the *combined* efforts of wind and steam, far outstrip our rivals; thus again restoring us to that mastery of the waves which signalized our country before all others, previous to the introduction of the European steam-ships.—*New York Courier, 24th November*, 1840.

Steam Ship "Clarion."

Extract of letter from the Messrs. Glover to the Editor of the *New York Herald*.

We beg to correct your statement in Saturday's *Herald* respecting the application of steam power to our ship *Clarion.* It is not the Archimedean Screw that we are going to apply, but a propelling apparatus possessing far superior qualification, viz.: Captain Ericsson's Transversal Ship Propeller, which has no other property in common with the screw of the experimental steamboat *Archimedes*, than that of *working entirely under water.*

Deeply interested in nautical commerce,

we have watched with much attention the effects of the introduction of steam power for ocean navigation; and carefully estimated the probable results of the application of steam to our unrivalled American packet ships, and we have arrived at the conclusion that an auxiliary steam power, capable of propelling our ships at from seven to eight miles per hour in calm weather, will effect a revolution in commerce far greater and more beneficial than the introduction of steam ships. With these views we have noticed with much interest the development of the invention, which we now are applying to the *Clarion.* We were present at the first trials of this ship propeller in England some time since, the result of which, corroborated by further trial of a practical nature, places the success of the principle to our minds beyond a doubt.

In endeavouring to introduce an improvement in navigation so much needed, and in the success of which so great an interest, both private and public, is at stake, we have been at some pains to ascertain the respective claims of the rival plans, and we find that there is so great a difference in the practical utility and economy of the two as to leave no room for hesitation as to preference.

The screw of the *Archimedes* works in a large square opening in the "dead wood" of the vessel, and requires, if applied to ordinary ships, an entire alteration of the stern, both costly and hazardous as to the strength of the after part of the ship. In addition to this the screw of the *Archimedes* is worked at such a great speed (exceeding one hundred revolutions per minute,) that the use of a heavy intricate combination of cog-wheels is required to give the necessary velocity, the speed of the *Archimedes'* engines being thereby actually multiplied five times. Without pretending to mechanical knowledge, we assert confidentally that such high speed must be very objectionable in practice, and cannot fail to be attended with loss of power. The excessive velocity of the screw, in particular, must be productive of much wasteful resistance in going through the water. We are supported in this opinion by the result of the late trial of the *Archimedes* at London against the tug *William Gunston*, in which the latter, with engines of less power, towed the *Archimedes* astern at the rate of several miles per hour, against the exerted whole force of her superior engine power.

The transversal ship propeller, which, from its motion being transversely to the line of the keel, is so named in contradistinction to the paddle-wheel, may be applied to any ship without the least alteration to her stern. It consists of a thin broad hoop, made of wrought iron, supported by arms of the same material, and attached to a central shaft, which passes through the run of the ship. To the circumference of the said hoop are attached a series of plates (spiral planes) also of wrought iron, placed at an angle, the whole weighing under 900 pounds; two of these propellers, revolving in contrary directions are applied, one on each side of the stern post, their axes being supported by iron braces secured thereto. The effect of the current of water produced by the motion of the propeller will increase the efficacy of the rudder. The distinguishing feature, however, of the transversal ship propeller, is that the contrary movement is effected, and the ship propelled at any required speed, without the use of cog-wheels; the whole arrangement being extremely simple. The total weight of the machinery for the *Clarion*, consisting of two engines of 35 horse power each, boilers, propellers, &c. will not exceed 20 tons. All will be ready to be placed on board by the end of next month.

RUSSELL E. GLOVER,
STEPHEN E. GLOVER.—

New York Herald, Nov. 24, 1840.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JOSEPH LEESE, JUN., MANCHESTER, CALICO PRINTER, *for certain improvements in printing calicoes and other surfaces.*—Petty Bag Office, December 24, 1840.

The first of these improvements refers to the employment of a peculiarly formed fabric instead of the blanket usually employed in calico printing. This is composed of several layers of calico or other suitable fabrics, coated and cemented together with a solution of india rubber: the ends being joined, an improved endless fabric is formed, having the necessary elasticity in its thickness, but non-elastic in its length and breadth.

The second improvement relates to what is technically called "rainbowing," which is performed in the following manner; a number of sieves containing the different shades of colour are placed nearly under each other; over each sieve a disc revolves having projections of copper wire or other suitable material, which dip into the colours. These discs are supported on pedestals which admit of easy adjustment, and are so regulated, that as they revolve, the projecting wires give colour to the cylinder in successively lighter shades, which are imprinted on the fabric under operation.

A third improvement relates to printing blocks, which are to be covered with a surface of india rubber, through which the pattern is to be cut, its sides being supported

by a thin metal edging. This arrangement will, it is said, greatly increase the durability of the block, while the pattern will be much better printed on the calico, &c.

JOHN JOSEPH MECHI, OF LEADENHALL STREET, CUTLER, *for improvements in apparatus to be applied to lamps in order to carry off heat and the products of combustion.*—Enrolment Office, January 8, 1841.

In using lamps for the purposes of lighting, whether gas or oil, in shops, rooms, or apartments, in most cases the heat and products of combustion have been permitted to pass into and mix with the atmosphere of the apartment, thereby contaminating it and rendering it both unpleasant and unwholesome. In some cases it has been attempted to get rid of this nuisance by the use of smoke consumers placed over the burners of the lamps; consisting of inverted bell glasses with a very small tube proceeding from their upper part into the external air. Mr. Mechi states, as the result of his experience, that the apparatus hitherto thus used, has been wholly inadequate for the purpose, from want of capacity in the conducting tube; he has also found that to obtain the greatest quantity of light from lamps, requires a draught considerably beyond what has hitherto been given to them, but which he proposes to effect by his improved apparatus. For this purpose, the lamps are to be placed as near as convenient to the ceiling of the apartment: immediately over them is an opening of any ornamental character, surrounded by a reflector of glass or metal, which throws the whole of the light down into the apartment. The aperture before alluded to, communicates with a series of sheet iron or other tubes, which are to be led as quickly as possible into a chimney or into the external air, and then carried up so as to give a sufficient draught for the purpose of carrying off the whole of the heat and products of combustion, and also to increase the intensity of the light. Or, the tubes may be applied to the purposes of heating, by leading them in a proper direction through the apartments to be warmed, taking care that each pipe is carried in an ascending direction all the way up. Other modifications of the apparatus, as adapted to wall and pillar gas lamps is shown, and it is stated that in order to realize the advantages of this plan the sectional area of the conducting hot air tube should be about 18 superficial inches for each burner consuming from 10 to 13 cubic feet of gas per hour, and in proportion for larger or smaller burners. A little larger or smaller will not matter, but if the dimentions vary much from these proportions, the effect will be impaired.

The patentee does not claim the method of carrying off the products of combustion when the sectional area of the upward continuation of the conducting apparatus from the lamp is not greater than that of the glass chimney; but he claims the peculiar arrangement of enlarged conducting tubes and reflecting apparatus as described.

WILLIAM PALMER, OF FELTWELL, NORFOLK, BLACKSMITH, *for certain improvements in ploughs.*—Rolls' Chapel Office, Jan. 8, 1841.

These improvements in ploughs are designed to reduce the friction of draught; to enable the plough to accommodate itself to any required depth of cutting; and to afford a more certain and accurate means of directing its course. These objects are effected by dispensing with the sole or slade, and causing the hinder part of the plough to be supported by and run upon a wheel behind the breast, which wheel is mounted in adjustable bearings, so that by its position the share may be made to cut into the earth to a greater or lesser depth, as circumstances or the nature of the ground may require. The draught of the plough is also capable of regulation by the adjustment of the drag-chain attached to a peculiar construction of "hake" at the head of the beam, and the coulter is so connected to the beam that it may be readily set to any depth or angle, according to the required work and direction. The general construction of this plough does not differ materially from those already in use—that is to say, it consists of a beam, bracings, and frame; a breast attached to the frame, with a share affixed thereto; handles for guiding, a coulter for directing, and a hake for attaching the drag-chain. The peculiar feature of novelty consists in a running wheel, about 18 inches in diameter, being attached by a pin or axle to a saddle iron; from the upper part of which saddle iron a perpendicular rod extends, having a worm or screw cut upon it. A bridge affixed to the beam and to the handles has an aperture through which the pin passes, and the pin, with the saddle iron and wheel, is held up by a screw nut on the top. The bracing is a plate of iron, about half an inch thick, having three arms, the upper two of which are securely fixed to the beam and to the handles by bolts, and the lower arm has a long slot in it, through which the axle of the wheel passes. The situation of the breast or mould board of the plough is immediately before the wheel, and the frame behind it, and the wheel by moving in the furrow keeps the under part of the breast and of the frame from coming in contact with the ground, and therefore a sole or slade, as in other ploughs, is unnecessary. According to the depth to which the share is wished to cut into the

ground, the running wheel is raised or lowered by turning the screw nut on the top of the pin. The hake at the end of the beam is formed by a frame which carries two perpendicular pins, the one being plain, the other having a screw cut upon it. A socket piece has an eye to which the draught chain is attached; through this socket piece both the pins pass, and it slides freely on the foremost plain pin, while the screwed pin holds it at any required point. In order, therefore, to raise or depress the drag chain, the screw pin must be turned round, which regulates the position of the draught. The coulter has a wedge-shaped cutting blade at the lower part, but is cylindrical above, passing through a cylindrical socket on the side of the beam. This socket forms the end of a bolt passed through the beam and through two disc plates, with a nut and screw at its reverse end, which being turned draws the coulter and the discs tight against the beam. This mode of fixing the coulter allows it to be placed at any desired depth; the inner disc plate is loose upon the pin and can be turned round; it is made thicker on one side than on the other, that is, its sides are not parallel but of a wedge form. Hence, by turning the inner disc plate round, the direction of the cutting part of the coulter may be varied so as to suit the angle of direction required.

Louis Leconte, of Leicester-square, Gentleman, *for constructing fire-proof buildings.* Enrolment Office, Jan. 9, 1841.

This plan consists in the employment of iron frames, to receive concrete matters for forming the walls. The basement story of the building is constructed according to the ordinary methods up to one foot or more above the ground; on the basement so constructed is to be erected the patent wall, formed of frames entirely of cast iron, in one or more pieces, or a combination of cast iron and wrought iron plates. These frames are to be set one on to the other until the required height is obtained, the necessary stability being obtained by means of steady pins at the corners of one frame fitting into holes made in the corners of the frame which is opposed to it. Suitable shaped frames are employed for the internal partition walls, and for doorways, window frames, &c. The flues of the chimneys are formed of iron or other metal pipes, placed in the thickness of the walls. When the required elevation is obtained, a concrete of any suitable materials is poured into the framing, and fills up the vacant space, giving firmness and solidity to the structure; a concrete of gravel and lime is preferred. To give steadiness, lead is to be introduced between the joinings of the iron work, in the manner well understood by workers in iron. The doors and window frames are to be fastened to the walls by any of the usual known methods. The main beams and cross beams of floors and roofs may be of cast iron, or formed of iron and wood; or they may be formed of one or more pieces of plate iron, bent up into an oval form, and straightened by an iron or wooden bar passing through them lengthwise, the upper edges of the metal being turned over to increase the strength. In the interval between the beams there are to be iron rods running in various directions, and supporting a metallic wire work, which forms the foundation of the ceiling. Similar wire work is to be employed in lieu of laths for all plaster surfaces.

Several modes are shown, in which the internal and external ornamental portions of the work may be arranged, as figures, cornices, &c., such ornaments being cast in iron in connection with the framing, or attached afterwards.

All the iron work is to be painted over with some suitable composition for preventing oxidation.

A building so constructed would no doubt possess the property of being completely fire-proof, but we fancy the same end may be obtained with greater facility, and with much more economy, by some of the older methods.

The claim is—1. The mode of constructing the walls of buildings by applying frames of iron filled with concrete. 2. The mode of constructing beams of bent plates of iron. 3. The mode of forming ceilings and other plaster surfaces by the application of wire work in place of laths.

Joshua Taylor Beale, of East Greenwich, Engineer, *for certain improvements in steam engines.*—Rolls' Chapel Office, January 9, 1841.

These improvements refer to the construction of rotary steam engines, and are said to be especially applicable to the purposes of locomotion on common roads, and wherever lightness and compactness are considerations. The engine consists of an elliptical formed chamber into which steam is admitted for working the pistons or slides (eight in number) as they are alternately brought into a position to be acted upon by its pressure. Two cams are placed opposite to each other within the chamber and fixed by pins to the casing: they are of such a form as that by passing over their edges, the piston or slides have their outer edges kept in close contact with the inner surfaces of the chamber. A drum is keyed to the main shaft, having a series of grooves formed in it, through which the pistons or slides traverse when working. Above and below this steam chamber, there are steam and eduction passages, regulated by two D slide

valves. Steam being admitted through the passages at the top of the chamber, its pressure will be immediately exerted upon the pistons, causing them to move round towards the exit passages at the bottom of the chamber where it will blow off. It will be obvious that from a perpetual flow of steam of sufficient density, acting upon the eight slides on their successive presentation, a continuous action is kept up. In addition, however, to the cams or wipers for keeping the slides in close contact with the internal surface of the chamber, steam of a higher pressure than that used outside of the drum is admitted to its centre, which passes against the inner edges of the slides causing them to follow the internal form of the chamber in close contact. These slides have metallic packings fitted to their outer edges to keep them steam tight.

For reversing the motion of the engine the rods of the upper and lower slide valves are attached to each end of a lever, whose fulcrum is in a line with the centre of the engine; on moving this lever backwards and forwards by a prolonged handle, the upper and lower valves moves in and out, which converts the steam passages into eduction ways, and *vice versa*. The patentee says, "I cannot but here remark that in practice I find this arrangement places the engine under such perfect controul, that even when working at a great speed its motion may be reversed several times in a single revolution!" When applied to stationary purposes, the engine is firmly fixed on a foundation by means of ribs, the feet of which are bolted to the chamber ends. When this invention is applied to a locomotive or marine engine, a bar is fixed to the chamber to prevent its turning, and, in the case of a locomotive, is detained by being fitted into a socket, or any convenient part of the framing at the other end; and in the case of the engine being applied to marine purposes, that end might be fixed to the lowest part of the vessel.

Another modification of the engine is shown in which the pistons rotate in a cylindrical chamber, being projected by an elliptical cam or guide. There is a circular groove in one of the end plates of the cylinder or steam chamber, an orifice communicating with which from the boiler itself, or the boiler side of the cock in the steam pipe, admits into it steam of a higher pressure than that let into the central part of the cylinder; this steam presses against the outer edges of the slides, and keeps them in close contact with the elliptical part.

The improvements, as regards the boiler, consist in a long tube, coiled, forming a kind of cage or box, in which the fire is to be placed. The water is pumped in at one end, and its reverse end connected with the engine is exposed to the action of the fire throughout its entire passage in the tube; the water is thus supplied to the engine in the shape of steam. There is a branch fitted with a cock for regulating the supply of water according to the requirements of the engine. The patentee uses water prepared with a certain quantity of lime, adding it until the water is very slightly alkaline; he says, "I find by precipitating the free carbonic acid and the earthy salt (carbonate of lime) contained in ordinary water, that I prevent the incrustation and priming in a great degree, which in locomotive engine boilers is a very great detriment."

The claim is, 1, the general combination and arrangement of the several parts represented and described; 2, the use of a bar, besides which no framing is required, nor any other support but that derived from the shaft; 3, the application of the boiler where great lightness and compactness are desirable; 4, the use of lime in the manner and for the purposes set forth in the specification.

George Barnett, of Jewin Street, London, Tailor, *for certain improvements in fastenings for wearing apparel.*—Enrolment Office, January 10, 1841.

Under this comprehensive title, our friend the knight of the thimble has contrived to embody just nine improvements on nearly as many articles of wearing apparel applicable to both the sexes. There are seven distinct claims, which may be briefly disposed of as follows:—

First, The construction of a peculiar kind of spring hook, formed by cutting out a curiously formed piece of steel, by means of a fly-press and dies, with three openings and two projections; the two projections are bent up into hooks and the other part of the steel bent over them with two of the openings opposite the hooks, forming a shield to them. The particular application of these spring hooks is not apparent.

Secondly, Instruments for securing buttons to clothes in those cases where the buttons are not permanently attached by sewing, but are temporarily affixed by putting the shank through an eyelet hole, and securing it on the other side. For this purpose a kind of triple "instrument" is formed by bending a short piece of wire, so as to have a middle and two side limbs; the middle member has a crook or loop about its centre, and one of its ends being free, is passed through the button shank until the shank reaches the crook in the centre, when the sides spring to, and the button is firmly attached to the garment without any liability to "come off." A second mode of forming these "instruments," consists in punching them out from metal plates, and bending the middle member over into the form and position required.

Thirdly, A somewhat ingenious mode of constructing hooks (for hooks and eyes) so as that they shall not be liable to be unfastened, except at the pleasure of the wearer; these hooks are of wire bent up much in the usual way, but one end of the wire is carried back from the bows and formed into a little projection within the hook part, which prevents the eye from passing in or out without the exercise of some degree of force, when the projection springs, and allows it to pass. (We have seen these articles in the market under the appellation of Rodgers' patent.)

Fourthly, a mode of constructing brace buttons with nicely rounded holes for the reception of the thread, so as to avoid all liability to cut the same, and to become detached from the important garment to which they form a necessary adjunct. These buttons are formed of two discs of metal, the one being larger than the other; the largest being operated upon in a suitable press, has the four holes and the outer edge struck down; the smaller disc just fits into this edge, and receives the four central projections in four holes provided for that purpose; it is then placed between suitable dies, which close the rim and edges of the holes down over it, and give the button the requisite dished form.

Fifthly, we have an improvement in buckles; on the underside there is a slight frame, upon which is placed the buckle proper, consisting of a framed lever tongue, either notched or plain upon the edge. The belt or other article being attached to the centre of the buckle, by sewing or rivetting in the ordinary way, the other end is brought over the frame and under both ends of the framed lever tongue, by which means it is firmly secured without penetrating into or through the fabric, as is the case with ordinary buckles.

Sixthly, an improvement in the belt or bands of trowsers and waistcoats that are fastened by lacing. As at present constructed, these two pieces hang loose, or are only connected by the lace; this patentee unites the two by a centre piece affixed just behind the lace holes; but we confess, the mighty great novelty or importance of this addition is altogether beyond our comprehension.

Seventhly and lastly, a mode of connecting trowser straps; the straps are in two parts, attached to each side of the leg; to one of them a brass stud is rivetted or otherwise fastened, furnished with a sliding piece; on the other there is a hole; on pushing back the slide the hole in the second strap is passed on to the stud, and the return of the slide holds it fast.

NOTES AND NOTICES.

London and Westminster Water Company.—Proposals having been issued for the formation of a company under this title, to supply the metropolis with *pure* water from a well in Bushey-hall meadows, the mill owners and other parties interested in the supply of water to the Colne river held a meeting on Wednesday last at Watford, Charles B. Curtis, Esq. in the chair; when resolutions were passed condemnatory of the scheme, as interfering prejudicially with private rights and property, and demonstrative of the errors, both as to facts and reasoning, contained in a report of Mr. Stephenson, published by the projectors of this company. The meeting announced its determination to offer the most decided opposition to this attempt, because every drop of the water pumped up from this well would be withdrawn from the Colne river, and the inhabitants of London could only get the proposed supply of water by depriving of their present supply the inhabitants of St. Alban's, Redburn, Hemel Hempstead, Two Waters, King's Langley, Watford, and many other places, scattered over 113½ square miles of country, the porous character of which forms the great natural reservoir of this fertile district. The late Mr. Telford saw that if the water was taken from the valley of the Colne for the supply of London, it must be by abstracting the water of the river, which he proposed to do on the only principle that his experience instructed him could be carried out or submitted to, viz., that of compensating parties whose property or interest must be affected by the loss of water, for the injury they would be subjected to; and this under-ground process of draining 113½ square miles of country, and diminishing the supply of water to the mills on the Colne, would never have been advocated or sanctioned by him. The public have been invited to subscribe £600,000 for the formation of the required works, which sum the meeting declared to be "about one-half of the sum necessary for the purpose."

Fire-escape Accident.—Soon after midnight on Saturday week last, a fire broke out in the back attic of a small house in Museum-street, Holborn. On the alarm of fire being given, a dilapidated fire-escape of Wivell's, recently stationed in Bloomsbury-square, was brought to the spot, and the conductor endeavoured to persuade the inmates to descend by his machine. The ordinary means of egress from the premises being perfectly accessible, the parties fortunately refused to comply with his request, and all escaped in safety. Unable to persuade anybody to enter his trap, actuated by a zeal worthy of a better cause, and desirous of "showing off," he ascended and entered the canvass trough himself; but had scarcely began his descent, than the canvas (which was perished and rotten) broke, and the poor fellow was precipitated head foremost from the second floor to the pavement. He was taken up in a senseless state, and conveyed to the North London Hospital, when it was found that, besides other injuries, he had sustained a severe fracture at the base of the skull, and still lingers in a deplorable and hopeless state. The fire brigade, with their engines, were promptly on the spot, and the hose being led up the staircase, they entered the attic, and soon extinguished the fire.

Erratum.—In Mr. Aris's communication, in No. 909, page 25, line 15, for "degree of latitude," read "degree in any latitude."

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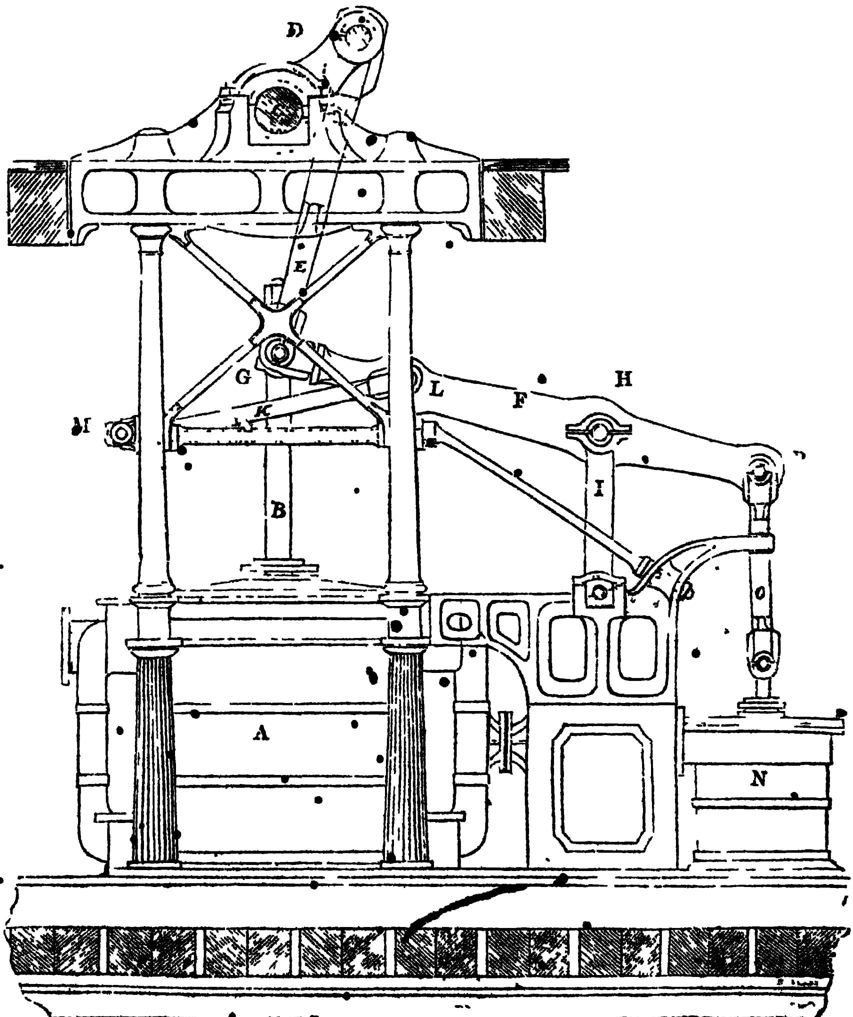
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 911.] SATURDAY, JANUARY 23, 1841. [Price 6d.

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THE GORGON ENGINES.



DESCRIPTION OF THE ENGINES ON BOARD THE "GORGON" AND "CYCLOPS" STEAM FRIGATES.

In the course of our last three volumes we have frequently had occasion to notice the "Gorgon Engines," and we some time back promised to lay before our readers, a full description of them. Of their performances, we have already treated very fully in previous numbers, and the celebrity which the *Gorgon* and *Cyclops* steam frigates have acquired by the share they have had in the late brilliant exploits on the coast of Syria, renders these vessels, and their engines, at this time, objects of additional interest.

For the following description we are indebted to Mr. John Seaward's pamphlet, from which we have already quoted, the two excellent papers "On Long and Short Stroke Engines," and "Long and Short Connecting Rods," published in our last volume.

The steam engines which have been supplied by Messrs. John and Samuel Seaward and Capel to the British steam frigates, *Gorgon* and *Cyclops*, and to several other large Government steamers, are constructed upon a plan differing materially from those which have hitherto been mostly used in steam navigation: they have been denominated "The Gorgon Engines," from the fact of a pair on this plan having been first tried on board the steam frigate of that name.

These engines are constructed on the principle of what is called the "direct action," that is to say, the power of the engines is communicated from the piston by the piston rod, direct to the crank, without the intervention of those side levers or beams, cross heads, fork heads, and side rods, which are usually employed in the construction of marine engines. The engravings on our first and third pages, the former being a side, and the latter an end view, will give a tolerable idea of the arrangement of these engines:

A is the cylinder; B the piston rod; C the main shaft; D the crank; E the connecting rod, which connects the top of the piston rod to the pin of the crank.

The top of the piston rod is constrained to move up and down in a perfectly straight vertical line by the aid of a peculiarly constructed parallel motion. The bar or lever F is jointed to the top of the piston rod at G, and it also turns or oscillates on the joint or bearing H, which joint or bearing is supported by the rocking standard I; the bar or lever F is retained by a pair of rods K, which are jointed at one end L to the bar or lever F, and at the other end to the fixed centre M.

N is the air pump, which is worked by means of the pair of side rods O, which are attached to a prolongation P of the aforesaid bar or lever.

It will be observed that the distinctive features of these engines are, first, the line of shafts being placed directly over the centre of the cylinders; and, second, the power being communicated direct to the crank without the aid of beams, cross heads, side rods, &c., as before stated.

The line of shafts rests upon strong frames, which are supported by wrought iron columns, standing upon the top of the cylinders: so that the whole force of the engines is confined between the cylinders and the supporting frames and columns, and does not act against any part of the vessel.

It should be observed that many engines have been constructed, previous to the Gorgon Engines, upon the principle of the "direct action," but the arrangements of all those engines have been widely different.

The advantages of the present system are very considerable, and consist of:—

1st. *A Great Saving of Space.*—A pair of Gorgon Engines do not occupy much more than one half the space required for a pair of beam engines of the usual construction.

2nd. *A Great Saving of Weight.*—The weight of a pair of Gorgon Engines is 25 per cent. less than that of a pair of beam engines.

3rd. *Greater Exemption from Accident.*—The simplicity of the arrangements, and the reduced number of moving parts, necessarily lessen the chance of accident, as also the wear and tear.

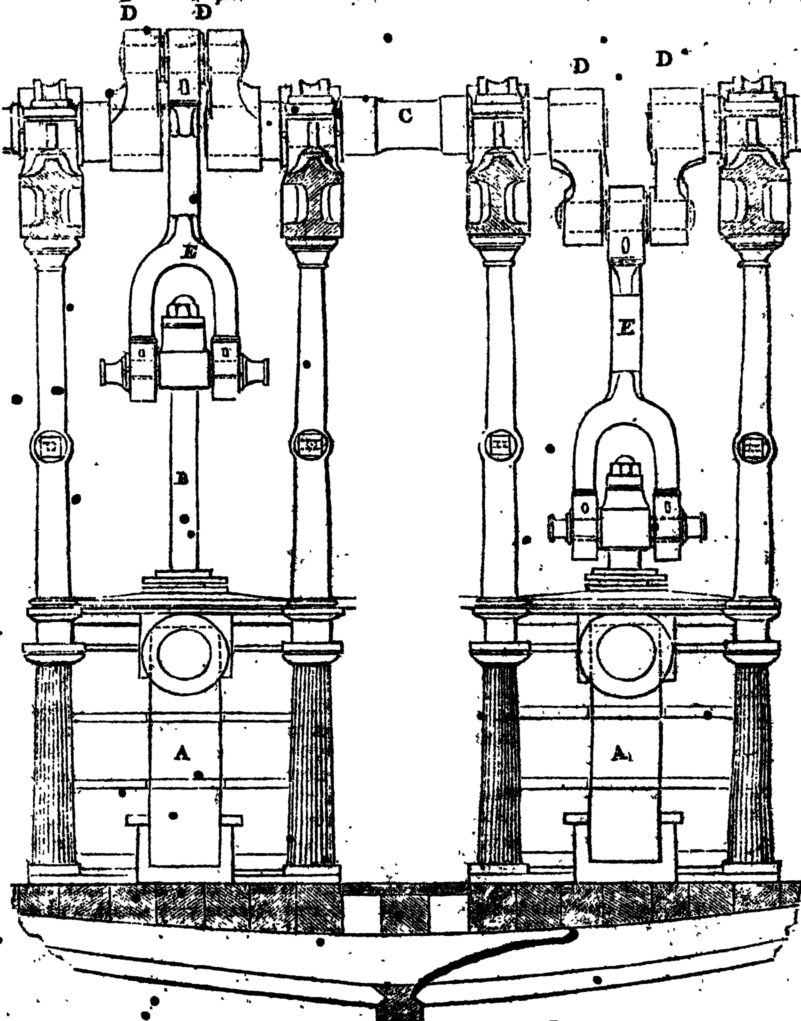
4th. *Greater Security for the Engine Men who work the Engine.*—There being no side levers or beams in movement, the men can move round the engines in every part with perfect safety; but they cannot do so with beam engines without much danger.

5th. *The Tremor and Vibration usually*

experienced in Steam Vessels are almost entirely prevented.—The chief cause of the tremor and vibration observable in steam vessels, is the pumping action of the beams or side levers, which causes a great strain and effort throughout the whole vessel; but there is nothing of this in the Gorgon Engines.

6th. *A more efficient and economical application of the motive power,*—resulting from the absence of a large mass of moving matter, and of many joints and bearings, the latter of which especially, is in ordinary engines the cause of much loss of power.

The advantages above enumerated will



for the most part be very obvious on even a slight examination by any impartial and competent judge; and of the great importance of the advantages themselves no one will pretend to doubt for a moment. Indeed as regards the successful application of this system, the matter is now placed beyond all dispute, as the trials of it, made in the *Gorgon*, *Cyclops* and several other vessels, during the last three years have been most satisfactory and conclusive.

SOFTENING ANIMAL MEMBRANES.

Sir,—In Number 909 of your very useful Magazine, "A Constant Reader and Well Wisher" asks if any of your readers can favour him with a process by which he can "render some dried animal skins thoroughly and permanently soft and pliable," which "have been preserved simply by drying, and are consequently too hard and inflexible to be applied to many useful purposes."

I would beg to observe to your correspondent, that he should have been more definite and explanatory, and have stated whether his "dried animal skins" are covered with fur or hair; and, supposing they are covered, whether it is essential that the fur or hair should remain uninjured.

As I am in doubt as to the exact nature and condition of these "dried animal skins," I will mention that bladders which have been dried until they are hard and inflexible, may soon be made to possess a silky softness, by placing them on the lap, and working or kneading them about with the hands in all directions.

This manipulation wrinkles the surface into innumerable folds, resembling those which may be observed in the skin of the back of the hand. By following out this hint I have made hare skins permanently soft and pliable; and the process may be much facilitated by rubbing a little sweet oil on their inner surfaces, and letting it remain for an hour or two. The superfluous oil may then be removed, and the manipulation commenced.

I am, Sir, your obedient servant,

CORIARIUS.

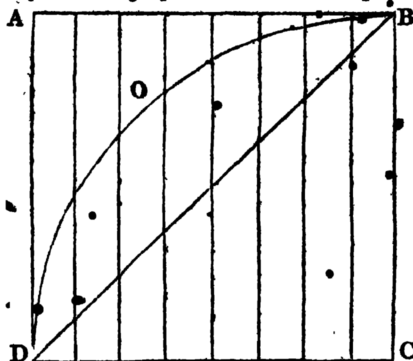
ON THE LOSS ATTENDING THE PRESENT USE OF THE CRANK.

Sir,—When we consider what a demand the rapid increase of steam navigation has on mechanical science for engines of enormous magnitude and power, the importance of satisfactorily and fully investigating the action of so important a member as the crank, hitherto so universally made use of, cannot be questioned; for if it be satisfactorily established that there is an actual loss of power to a very considerable extent connected with its use, it must lead to some alteration, whereby power, equivalent in some instances to 200 horses, with the space fuel, &c., connected therewith, may be dispensed with. The importance also of this irregularity is not a little increased by the circumstance, that several intelligent mechanics of extensive practical experience and theoretical acquirements, have taken up views on the subject, at variance with some of the most celebrated writers on mechanical science; and as it is, to practical men from whom improvements may be expected, the removal of any obstacles of a theoretical nature, if such exist, must be very desirable. It is too much the fashion to oppose the doctrine contended for in this paper, in such a manner as this, "that at the present age of mechanical science, it is surprising that any person acquainted with the subject, could entertain the notion that any arrangement of long or short connecting rods or crank movements, could either increase or decrease the effective power of the engine;" and ingenious minds will often be led astray, and prevented from applying their energies to a subject of great importance by such observations, coming from persons whose great practical experience entitles them to considerable weight. A celebrated writer has said, "that to pick it to the bone is a certain way to establish any important fact in science," and I dont know through what better medium such a thing can be accomplished than by means of your very useful Magazine.

A correspondent of yours at page 572 of your last month's Magazine, has shown a very ingenious mode by which the loss of power on the crank can be proved, although I believe the paper was written to have a contrary effect. I say *believe*, for it does not appear whether the writer is an advocate for the loss of power or not. His paper proves what the average leverage of an infinite number of sines would be, but this is not the question; the difference between the average leverage of a finite and infinite number of sines is very small, and never was called in question in the discussion; but if he contends by that paper, that there is no loss of power, the error, I presume, he has committed, is this,—that he makes the power move through half the circumference of the circle made by the crank pin, whereas, he should have made it move but through the diameter of the circle. He might as well in calculating the power of a fall of water be guided, not by the perpendi-

cular fall, but by the measurement of half the circumference of the wheel; he must therefore reduce the average leverage which he gives, as I stated in my former letter, inversely in the proportion which the circumference of a circle bears to its diameter, and the difference between their numbers will be the loss sustained.

In the square A B C D, describe the quadrant D O B, and draw D B; let B C represent the power; then the square



A B C D will represent the work done, when the power represented by B C moves without any reduction from C to D. Draw a number of perpendicular lines at equal intervals, which, in the quadrant, will represent the natural sines—not certainly of an equal number of degrees, as Mr. Aris has done, for being equally divided in the base line D C, they will be unequal in the quadrant. The triangle D B C will represent the work done, when the power B C is uniformly reduced; and the quadrant D O B C, the work done by the crank when the throw is equal to B C, or D C and the power equal B C; therefore, the loss of power will be the difference between the square A B C D, and the quadrant, D O B C; in other words, the loss of power in the crank amounts to the difference between the square and its inscribed circle. This loss of power, from its geometrical construction, is not the only loss it is subject to, but it will be time enough when we have settled mathematically *a certain loss*, before we enter upon a subject that branches into more debateable ground, and it would therefore be well to have a good foundation to build any future arguments on.

I am, Sir, &c. M.

THEORY OF PARALLEL LINES.

Sir,—I think it the duty of every writer in the *Mechanics' Magazine* to notice the remarks that may be made upon his productions; if in error to acknowledge it: if in the right to defend it, (always excepting, as is sometimes the case, that such remarks should carry with them their own refutation).

I long since anticipated the objection that Kinclaven has pointed out to my first Proposition, and I am therefore prepared to answer it without delay. I fully admit the correctness of his objection; I admit also, that if the defect be points out cannot be remedied, it is quite fatal to the proposition: but, Kinclaven will allow that, if it can be proved that H A G is, of necessity, a right angle, (on the supposition of the equality and mutual bisection of H G, A B), then, the defect will be remedied, and the demonstration stand good. I therefore send the following proposition for insertion, in order that its demonstration may exercise the mathematical ingenuity of your readers: premising, that I think I may safely assert, that a short and satisfactory demonstration to it *does* exist, and that I shall be ready to produce it, if needful, at a fitting time.

Prop. Theor.

"In any quadrilateral, the diagonals whereof are equal and mutually bisect each other, the four angles contained by the sides are equal, and each of them is a right angle."

(To be demonstrated without going beyond the 26th of the 1st Book of Euclid.)

NAUTILUS.

January 9, 1841.

P.S. For the sake of the classical credit of the *Mechanics' Magazine*, permit me to intimate to "Scalpel" (with whose letters I have otherwise no concern,) that his quotation on page 458, No. 905, is not, as he calls it, a Horatian maxim, but an epigram of Martial; also that "*vult,*" instead of "*vis,*" is a misquotation, and inconsistent with the rest of the sentence. As for the appropriateness of the quotation, *that* is, of course, a matter of opinion; the poet referred to *manner*, not to *matter*.

LAW OF EQUAL DIFFUSION OF HEAT—CIRCULATION OF THE BLOOD, RESPIRATION, &c.

Sir,-It is a very pleasurable circumstance when a controversial opponent, in his endeavours to controvert the opinions of his antagonist, unwittingly furnishes demonstrative proofs of their correctness, instead of their inaccuracy; and I truly felt all its enjoyment in perusing the last letter of "A. Y." in your 905th Number, page 553, in reply to mine in your 893rd Number, page 296.

To the several opinions which I have advanced in the discussion of the subjects of caloric, and the circulation of the blood, "A. Y." objects but to two in his last letter—that the space within the receiver of an air pump, usually supposed to be vacant on the withdrawal of the air is not vacant, but on the contrary is filled with heat, and that such heat becomes latent on its entrance into the receiver; and, again—that the impartation of heat to the blood, resulting from the decomposition of atmospheric air within the lungs, is the primary cause of its circulation. It now devolves on me to show, that in his attempt to disprove the correctness of those opinions, he has furnished the best possible corroborative evidence of their accuracy.

It will, perhaps, be remembered by many of your readers, that the origin of the discussion relative to the vacuum in the receiver of the air pump, is to be traced to Mr. Prater's first communication to your pages, wherein he offers as a proof of inherent activity being a property of the particles of matter, that water being placed in a vessel beneath the receiver of an air pump, will boil on the removal of the pressure of the atmosphere from its surface — leaving the inference to be drawn, that the inherent activity possessed by the particles or atoms of water, being no longer subjected to a state of quiescence, by the more powerful force of the weight of the atmosphere upon its surface, resumes its natural action—motion, the effect of that inherent power, as soon as the superior restraining power is removed, as is evidenced by its ebullition. It will also probably be remembered, that I endeavoured to prove the fallacy of such doctrine, and endeavoured to account for the ebullition of the water, on the supposition that heat, in obedience to the law of equal diffusion to which I imagine it to be subject, permeates the glass receiver on the withdrawal of the air from its interior, and that the force of entry of such heat, or the force of exit of the thermometric heat of the water to fill up the vacuum, caused an agitation of the water, equivalent in appearance to what occurs in ebullition under customary circumstances; and that as soon as the space pre-occupied by the air is filled with heat, and a restoration of the thermometric temperature of the water to a state of equilibrium is effected, that then the heat occupying the receiver in the space not occupied by the water, &c., becomes latent. (For a fuller exposition of my opinion, and somewhat corrected, on this subject, I beg to refer to my letter in reply to Mr. Prater, inserted in your 898th Number, page 497.)

Now, "A. Y." to prove the improbability that the heat which enters the receiver on the withdrawal of the air, can become latent, instances the fact, that a thermometer cooled below the temperature of the atmosphere previous to its being placed in the interior of an exhausted receiver, will be found quickly to rise to the same point, and be subject to the same fluctuations as take place in the external air.

And this practical proof in support of the fact, appears to me to be the very evidence requisite to prove the correctness of the hypothetical opinion furnished by me, that no real vacuum can exist, and that the amount of heat which enters the receiver, over and above the quantity necessary to effect a thermometric equilibrium, becomes latent, and for the supply of such evidence I have to tender to "A. Y." my best thanks. The primary law of equal diffusion, and the secondary law of recession from the centre of the earth, to which heat is subject, is the hypothetical doctrine which I have endeavoured to establish and maintain; and I conceive that "A. Y." fully proves the existence of the first law, when he admits of the permeability of the glass receiver to heat, in the way of ingress and egress,

in raising and diminishing the indications of the thermometer within the receiver, to the indicated thermometric temperature of the atmosphere without; and I also conceive, that he fully proves the existence of the second law, when he states at nearly the close of his letter, "when the lower portion of any fluid receives an increase of temperature, it is thereby rendered of lighter specific gravity, and rises to the surface, while the remaining portion of the liquid that has received no impartation of heat, descends to take its place, and restore the equilibrium." Thus then I conceive that I have obtained "A. Y.'s" services as an advocate in favour of the opinion that heat is subject to the law of equal diffusion and recession; and his admission of the fact, that heat enters an exhausted receiver by permeation, as induced by the first law, prompts me to ask—where then can be the difficulty of admission that the amount of heat which enters may be more than is sufficient for thermometric equalization? For surely if heat passes from the external atmosphere through the glass receiver and the glass tube of the thermometer, in order to raise the mercury within to the same temperature as the external atmosphere, and the motive power that causes the transit is the law of equalization, the same power must operate to induce the transit of heat to fill up the vacuum, since the difference in the presence of heat in the vacuum, and the mercury must be as 0 to some definite yet inappreciable amount; and therefore as the inequality in the distribution of heat between the vacuum and the atmosphere is greater than the difference between the mercury and the atmosphere, so must the impelling force of transit to the vacuum be greater than to the mercury. And if this theory is admitted, and the fact is evident, that the heat which enters to fill up the vacuum, does not raise the thermometric temperature of the mercury above that of the external atmosphere, why then the conclusive proof must be, that such heat as occupies the vacuum must be latent.

Equally fortunate do I consider myself in having, as I conceive, obtained the corroborative testimony of "A. Y." to the probable correctness of the hypothetical opinion which I advanced,—that the primary cause of the circulation of the blood is heat,—and which is contained in the following extract from "A. Y.'s" letter:—

"It is argued that the valves of the heart exert their projectile force in propelling the blood through the vascular system independently of any source of motion contained within the blood itself, but that this action is kept in constant play by a quickening stimulus exerted by the blood upon the interior surface of the heart in contact with it. *This application of stimulus is kept constantly maintained by the high temperature resulting from chemical action with atmospheric air in the process of breathing.*" Here then is expressed by words (in italics, but not so in the original) as plain as the English language can well furnish, that the stimulus to the action of the heart is high temperature, (otherwise heat) and that such heat is derived by the blood from atmospheric air, by chemical action in the process of breathing; the very sum and substance of the way and manner by which I stated that the circulation of the blood is effected. And who will say after this, that "A. Y." has not proved an advocate rather than an opponent of the opinions which I have expressed?

But "A. Y.," in his first letter, stated that I had entered the lists of discussion on higher ground than the subject of brewing, and that he was sorry to add, without being accompanied by the same correctness or intelligent principles; and he having thus pronounced me incompetent to the task, it would be presumption in me to endeavour to point out that which appears to me to be a glaring error in the statement of "A. Y.'s" authority, or in "A. Y.'s" quotation from that authority, "that the valves of the heart exert their projectile force in propelling the blood through the vascular system," &c.; because, from my reading, I learn that such projectile force is due to the contraction of the left ventricle of the heart, in propelling the blood through the vascular system, and that the valve situated between the left auricle and the left ventricle is merely opened by the propulsive force of the blood in its entrance into the ventricle from the auricle, and is again closed by the propulsion of the blood in the ventricle upon its contraction, in order that such blood may not regurgitate to the auricle; and, again, the valve

opening outward from the ventricle into the interior of the artery, and opened by the propelling force of the blood resulting from the contraction of the ventricle, is again closed by the reactive pressure of the blood resulting from the contraction of the arteries, in order that the blood expelled from the ventricle may not be returned to it by the pressure of the artery resulting from its contraction; and thus the valves are subject but to passive action, and do not furnish a motive force, resulting from a stimulating action.

Having, I trust, succeeded in proving the probable correctness of the hypothetical opinions which I have advanced, and made due acknowledgment to "A. Y." for his assistance, although not, perhaps, intentionally furnished, I think I may be well excused from wearying both your readers and myself, in pursuing this part of the subject further; but before I close my observations on "A. Y.'s" letter, I cannot but notice his remarks on the little utility of hypothetical observations on natural phenomena, and the very prompt indulgence by himself in this reprehended sin, as is evinced by his hypothetical opinion, that probably caloric "may be that subtle ether which there is reason to believe occupies the vast extent of universal space," &c. Not that I blame him for enjoying what I deem so useful and blameless a recreation, only I would recommend him for the future to secure well his own windows before he ventures to throw stones at his neighbours. And as relates to the opinion which he offers on that subject, I have long since concurred with him that such is the case, and that the recognition of the two laws which I have endeavoured to prove that heat is subject to—the primary law of equal diffusion, and the secondary law of recession—is sufficient to elucidate and unfold those natural operations, which have hitherto been ascribed to this imaginary and unknown "subtle ether."

Nevertheless, I feel convinced that I have much intruded on your columns and time, and on the patience of your readers, in discussing theoretical subjects rather than practical; and therefore with your permission I will now endeavour to make some little atonement for the offence, and endeavour to point out to some of your readers who may need the information, some of the practical advantages which may be derived from a theoretical knowledge of the process of respiration, and the effects produced both in the circulation and sanatory condition of the blood; and I am induced the more so to attempt it, inasmuch as "A. Y.," spite of his partiality for practical information, has refrained from doing it in reply to the request I made him.

The process of respiration consists in the inhalation of atmospheric air and vapour, and the expiration of nitrogen gas and vapour. Atmospheric air is a compound of pure air and a variety of noxious gases, with which water is blended in the form of vapour, and often holds in suspension a variety of finely comminuted terrestrial substances. The air inhaled is decomposed within the lungs. Pure air is composed of oxygen, nitrogen, and latent heat. In respiration the oxygen, and a great portion of the latent heat, is imparted to the blood in its passage through the lungs, the latent heat being rendered active as the result of the decomposition; and the nitrogen and a great portion of the latent heat thus rendered active is emitted by expiration. Such gases as are inhaled with pure air in the process of respiration, are also exhaled, save such as may amalgamate with the blood, or combine with the materials composing the inductive passages to the lungs. Water inhaled in respiration, mixed with atmospheric air at a low temperature, is exhaled in the form of vapour of an increased temperature, except such as may remain as a constituent of the mucus formed.

The oxygen imparted to the blood changes its properties and colour, and in its passage through the lungs the venous blood is changed into arterial. The heat imparted to the blood in its passage through the lungs causes its expansion, enhances its fluidity, and promotes its circulation, and oxygen and heat are the indispensable principles which are necessary to sustain animal life; and the administration of each in due and proper proportion, is one of the most important of the means which are requisite to the preservation of health—the oxygen imparting an invigorating and stimulating principle, and the heat causing the circulation of the blood, and thereby the conveyance of its nutriment to the whole

extent of the system—facilitating the proper secretions, and promoting the action of the nervous fluid. In the process of respiration, the means employed are admirably adapted for the accomplishment of the required purpose, by the allwise and inimitable creator and establisher of the process. The air and vapour inhaled is of a lower temperature than the nitrogen and other gases and vapour which are exhaled, and as the specific gravity of the latter is less than the former, and a short pause occurs in the process between the act of inspiration and expiration, means and time are furnished for the ascension of the emitted gas and vapour, before the act of inspiration recommences, and thus that which is voided, and is not only incapable of supporting animal life, but is also destructive to it, escapes and is not re-inhaled. The change in the specific gravity of the vapour inhaled, by the impartation of heat thereto, resulting from the decomposition of the air inspired, is also highly necessary and advantageous, as thereby its exhalation is effected, the retention of which in the lungs to a trivial amount would prove injurious by impeding their action and producing disease therein. The inhalation of vapour serves to lubricate the passages to the lungs, and to supply, most probably, the salivary glands with moisture. The inspiration of finely comminuted terrestrial substances floating in the atmosphere, proves injurious in proportion to the quantity and property of the material which reaches the lungs, and therefore provision is made for the deposition of part in the transit, and the collection of the residue in the formation of mucus, and its final rejection from the lungs by expectoration.

From these several facts, and others, the following useful considerations and information may be obtained. That the rapidity of inhalation and exhalation in respiration is proportionate to the muscular exertion of the body, and as the impartation of oxygen and heat to the blood, and the resulting benefit, is proportionate to the amount of air decomposed within the lungs, and as that decomposition is proportionate to the rapidity of respiration, so muscular exertion of every description within the limits of safety and moderation, is highly conducive to the maintenance of health.

As the inhalation of nitrogen gas alone is destructive of life, so pure air diluted with nitrogen gas is partially destructive of life, or highly injurious to health, and to an extent proportionate to the amount of the deleterious admixture, and therefore respiration effected in inadequately ventilated rooms, or in crowded apartments, in which the nitrogen gas emitted from the lungs of the inmates cannot find exit with a rapidity proportionate to the speed and amount emitted, subjects the individuals therein to a temporary or permanent derangement of health, proportional to the period of occupation or the degree of deterioration to which the air is subject, by its admixture with the nitrogen emitted. And the salutary inference to be drawn from this fact is, that in the construction of buildings for habitation, the principle of ventilation should be sedulously attended to, as applied to sleeping apartments as well as those of daily occupation. A variety of gases destructive of life, or highly injurious to health are occasionally mixed with the air we breathe to a dangerous or insalutary extent, and constantly so to a small amount, such as carbonic acid gas, carburetted hydrogen gas, a variety of mephitic gases, &c., and therefore the inhalation of such deteriorated air must be more or less prejudicial, in proportion to the amount of the deleterious admixture, the period of inhalation, and the constitutional or incidental physical condition of the individuals subject to its respiration; and as relates to the mephitic gases, such as malaria, miasma, &c., a residence near stagnant water, marshy lands, foul ditches, improper drainage, in the vicinity or midst of a dense and uncleanly population, in proximity or midst of a neighbourhood of factories, whose chimnies or ventilating apertures pour forth the various gaseous products of combustion resulting from manufacture, renders the resident or workman liable to all the insalubrious effects accruing from the respiration of a vitiated atmosphere. But infinitely more pregnant with danger is the inspiration of the impure atmosphere of ill ventilated dwellings, and the domestic habits of whose inmates are uncleanly to a disreputable, disgraceful and dangerous degree; whose habitations are but as pest houses, and whose inmates are but the stalking disseminators of

pestilence, disease and death; whose nightly covering and daily clothing are saturated with putrefactive secretions, and exhaling gaseous miasmia, which are inhaled with the atmosphere, conveyed to the lungs, and infused into the blood, engendering putrid, typhus and other malignant fevers. Pure water, intermixed with the atmosphere in the state of vapour, is conducive to sanatory respiration, both in the action of inspiration and expiration; and hence an atmosphere rendered too dry by an artificial increase of its temperature, is rendered less salubrious for respiration, while an atmosphere charged with too much moisture, may prove equally or more injurious, causing rheumatic, febrile and pulmonary diseases.

Every artificial mode of elevating the temperature of the atmosphere for animal respiration, which deprives it of a portion of its oxygen, either by its decomposition resulting from the combustion of fuel, or highly heated metallic surfaces, is to be deprecated, and much greater is the occasion to reprobate the use of stoves, that permit any portion of the gaseous products of combustion of the fuel within, to escape into the apartment, as the result of any improper mode of construction or fitting up, defect in principle or erroneous management. The preservation of the temperature of the blood at an average of 98 degrees either by rendering the impartation of heat, by the medium of respiration resulting from the exercise of the body, equal to the abstraction of heat from the surface of the body as effected by various means, is far more salutary than the endeavour to prevent the abstraction from exceeding the impartation by an excessive quantity of clothing, or residing inactive in a naturally or artificially heated atmosphere, inasmuch as the impartation of oxygen is commensurate to the impartation of heat, and muscular action facilitates and promotes healthy digestion and secretion; and the impartation of heat, enhancing the fluidity of the blood, and the impartation of oxygen increasing its vitality, and the impartation of both accelerating its circulation, its purity is promoted, the quantity and quality of the nutriment it conveys to the animal system are improved, and the baneful effects of its turgidity are obviated. The finely comminuted terrestrial substances which float in the air, prove detrimenta to the process of respiration, and peculiarly so to those who are subject to the disease of asthma, whose lungs are not sound, and the action of which are not powerful; hence the avocations of the miller, the feather dresser, the cotton beater, the grinder, &c. are by no means healthy employments.

These few hints and suggestions which I have submitted with a view to their being useful to your young and inexperienced readers, might be beneficially enlarged, and much more so by the pen of the medical profession than by mine, and having already trespassed too much on your time and space, I must leave the subject to be finished by some more competent person that may feel disposed to undertake it, and am Sir,

Your obedient Servant,

G. A. Wigney.

Brighton, Jan. 11th, 1841.

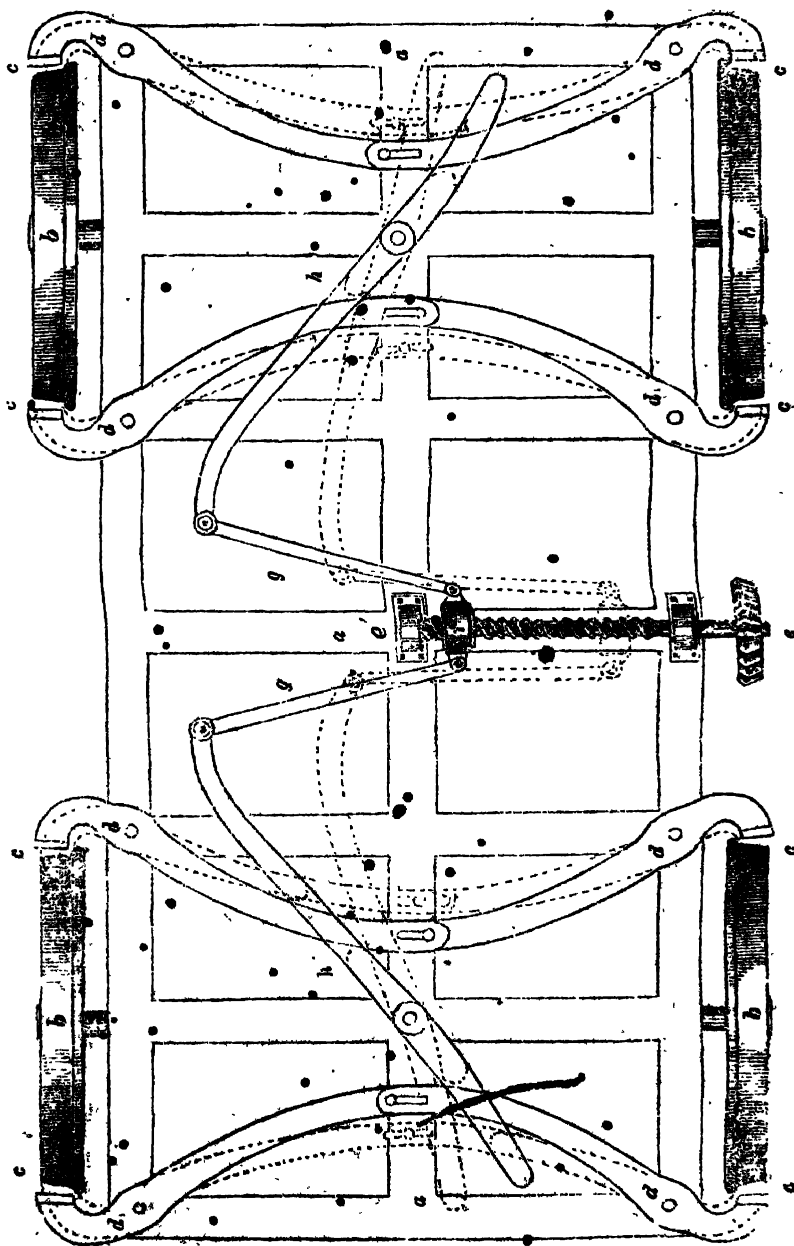
DAVIES' DESIGN FOR A RAILWAY CARRIAGE BREAK.

[Registered pursuant to Act of Parliament.]

The recent frequent occurrence of accidents on the several lines of railway, has called loudly for remedial measures, and forcibly attracted public attention to the various weak points and sources of danger to which this mode of travelling is liable. An immense amount of talent has consequently been directed to all the details of the railway system, and there is good reason to hope that within a very short time great improvements will result, and practical means adequate to prevent the recurrence of accident, or at least to avert its consequences, will be universally adopted.

Among the most imperfect of the mechanical details, we may notice the breaks, the defectiveness or unworthiness of which has induced great carelessness as to their employment. In some recent cases of accident it appeared that not a single carriage in the train was provided with these essential appendages.

With a view to improvement in this particular department, the simple and ingenious system of breaks, of which the engraving on the opposite page will at a glance convey the idea, has been produced by Mr. David Davies, of Wigmore-street, Cavendish-square, inventor of the Pilentum, Cab phaeton, and other favorite plea-



sure carriages, and well known as the extensive carriage builder to the Great Western Railway Company. His break is superior to any contrivance for this purpose which has hitherto been published, and may be described as follows:—*a a* represents the underside of the framing of a railway carriage; *b b* are the four wheels; *c c* are breaks on the extremities of eight long levers, whose fulcra are at *d d*; *e e'* is a shaft carrying a quick threaded screw, working in fixed bearings, and furnished with a bevil wheel *e*, for connecting it with a vertical shaft and handle, led off to any point at which it may be convenient for the breaksman to be stationed; *f*, is a traversing nut, attached by the connecting rods *g g* to the two cross levers *h h*. There are two mortices in each of the cross levers, through which the break levers pass; these levers are connected by a pin on the extremity of one lever sliding in a slot in an iron plate on the end of that opposite to it, so that any motion conveyed to the one, is simultaneously communicated to the other.

Motion being given to the screw *e e'*, the traversing nut *f* is drawn towards the bevil wheel, which causes the several levers to assume the position shown by the dotted lines, which will occasion the breaks *c c* to press against the circumference of all four of the wheels with immense force, preventing their rotation and converting the carriage into a perfect sledge. This combination of the mechanical powers is so favourable to the developement of power, that with such an arrangement it would be almost possible to crush the wheels. In all the breaks we have hitherto seen, there has always been a violent thrust between the wheel and the carriage, or between two of the wheels, tending to bend or break the axles; in the present plan there is not the slightest strain upon the axle, the gripe being exerted on the two opposite sides of the wheel, and the force that might be thus applied with perfect safety, would be sufficient, if applied in the usual manner, to cause an inevitable rupture in the machinery. Although the action of this break is rapid, it is by no means so sudden as to entail any evil upon that account.

In illustration of the power of such a system of breaks, let us suppose that each of the breaks *c* presents a surface of only three times the area of the bearing surface of the wheel upon the rail, and that the total weight of the carriage is ten tons; it follows then that if each of the eight breaks were pressed against the circumference of the wheel with a force of little more than eight hundredweight, rotation of the wheels would be effectually prevented. When it is further seen that this small force is exerted through the medium of a screw, acting upon a system of levers most advantageously disposed for the multiplication of power, it will be evident that the application of a few pounds to the break handle would instantly arrest the progress of the wheels. One or two carriages so stopped would soon annihilate the momentum of the longest train, and enable it to be "brought up" within so short a distance as greatly to reduce the liability to collision or other serious accident. We understand that all the railway authorities who have inspected Mr. Davies' plan, have expressed their unqualified approval of it and their strong conviction of its great utility.

ON GAS LIGHTING.—ECONOMICAL MODE OF SETTING AND WORKING RETORTS, SHEET-IRON PIPING, &c.

Sir,—Amid the multiplicity of inventions and improvements of modern science, we ought not by any means to neglect one which is of such high importance as gas lighting. Not only is it important to capitalists, but also to a great portion of society, and one which only a few years ago excited the greatest wonder and admiration.

Although we may perhaps have arrived at something like perfection in point of theory, still there is much to be done in the practical carrying out of theoretical principles in a more simple manner, and what is of most importance with a smaller outlay of capital at the onset, and a subsequent reduction of expenses of working them, so as to realise a greater return for the capital embarked.

It is by these means alone that a more extended system of gas lighting can be achieved, whereby our smallest towns can profitably avail themselves of so great a comfort, and I may say, in some instances, a luxury.

Many patents have been obtained for different kinds and constructions of re-

torts for generating the gas. Brick ovens have been patented and used with various success; still in many large establishments the circular retort prevails as first invented at the commencement of this extensive manufacture.

Whatever advantages may be derived from the use of large brick retorts, or ovens, as they are sometimes called, or by setting a number of iron retorts in one furnace in large works, to reduce the proportionate amount of fuel consumed in heating them, there is no chance of our smaller towns and villages availing themselves of this plan, as these means are two extensive to be adopted under such circumstances.

In such localities (as indeed in all others), therefore, we must endeavour to obtain a plentiful supply of gas from as small a retort area as possible, as this is a serious item in the expenditure of a gas manufactory; and also to heat the same without any loss or consumption of fuel in the furnace wherein the retort is fixed.

Now to effect these purposes, my attention for the present being directed to the small town of Wem, I have at this time one circular retort, 15 inches diameter and 7 feet long, set in a circular oven 7 feet in diameter; the bottom is laid with fire bricks, and the top, which is of a dome shape, rises about 4 feet 6 inches. This oven is charged with about 10 cwt. of rough slack from the neighbourhood of Rhuabon, in Denbighshire; the door way is then bricked up, and in 26 hours it produces about 6½ cwt. of good strong coke, which I sell for malting and other purposes. By the heat given out during the coking process, the retort is kept constantly at a bright red heat, almost approaching to whiteness, whereby I am enabled to make as great a quantity of gas from one as I formerly could from two and sometimes three retorts.

There are 36 streets, and about 150 private lights; but as I only employ one, and that not an able man, the retort is idle a portion of its time; but if worked regularly and unremittingly, I have no doubt it would supply 250 lights.

Here then, where there is a good market for the coke, there is not only a profit on the process of converting slack into coke, both in the oven and in the retort, but one actually does the work of two or three, whilst the man has the firing to attend to only once a day, thus diminishing his labour by one half; the use of fire doors, frames, and bars are also dispensed with. The expense of putting up an oven of this description is not more than half that of the usual mode, being extremely simple in its construction and action, and where smoke is not much nuisance, a chimney is unnecessary, as no draught is required to this kind of oven.

Two retorts may be fixed in the same oven as easily as one, and worked in precisely the same manner. I should have stated that the oven above described has been in work since Midsummer last, and has realized my most sanguine expectations; the present retort was put in about the middle of September, and I expect it will last another fortnight.

If piping made of suitable sheet iron turned and brazed, precisely as I have seen iron tubing on the continent, were made use of in the ascension pipes, hydraulic mains, condensers, &c., it would not only be cheaper and more sightly than the masses of cast iron now made use of, but by bringing the crude vapours in closer contact with the atmosphere would very much assist in the important process of perfect condensation.

Trusting the above will be of service to some of your numerous readers I submit it to you for insertion in your highly valuable and widely circulating journal.

And am Sir,
Your most obedient servant,
JOHN THOMAS.

Wem, Salop, Jan. 18th, 1841.

IMPROVEMENT IN LOCOMOTIVE STEAM ENGINES ON RAILWAYS.

Sir,—Though it cannot be for a moment doubted, that railway travelling is attended with far less personal risk than any other mode of conveyance, yet, it is not to be denied, that accidents attended with great loss, both of life and property, have (more especially of late,) been neither "few nor far between." Scarcely a newspaper now appears that has not some "dreadful collision"—"blowing up"—"running off the line," or other sad mishap to recount, and the next weekly sheet, whilst it gives you

the result of "crowner's quest" upon the former, perhaps announces another calamity still more awful than the last. Though some of these accidents are the necessary results of the railway system, yet, a great portion of them arises from the ignorance and carelessness of the engine drivers themselves; sometimes neglecting to shut off the steam soon enough on arriving at a station; at others, in leaving an engine standing on the line ready for any busy-body who is fool enough to "let on the steam," but not wise enough to shut it off, but who, frightened at what he has done, jumps off, leaving the fire-eater to follow the impulses of its own nature, and thus work its own destruction; nay, an instance has occurred, where one of these "Fire-kings," "Salamanders," "Dragons," or what not, having had his belly well filled betimes in the morning, has walked quietly out of the station, alone, (*the regulator being left open,*) and no sooner "scented the morning air," than off he went, as fast as good keep, and light work could make him. Such cases as these, Mr. Editor, I propose to meet by the following simple plan which occurred to me immediately after the late fatal collision at Harrow. Suppose, A B C D, in the annexed figure

Fig. 1.

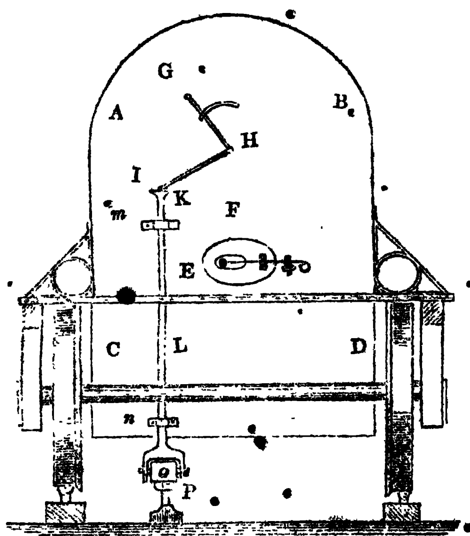


Fig. 2.

P Q

to represent the hind part of a locomotive, E being the plate upon which the engine driver stands; F the fire door; G the regulator handle, and H the spindle, upon which I propose to fix a lever H I, at right angles with the regulator handle; further, let K L represent a straight bar, sliding in a vertical direction in the two guides M N, the top coming in contact with a pin fixed in the end of the lever H I, and the bottom carrying a friction roller O. If then, an engine thus mounted were running upon a railway upon which was fixed an inclined rail, P Q, fig. 2, about 15 or 20 yards in length, and rising about 6 inches in that distance, and so placed, that the friction roller O, should come exactly over the check rail P Q, it is evident that the steam would be shut off immediately the engine came over this rail, whether there was a "living soul on

board" or not. Nothing then is required but a check rail of this description, fixed a little in advance of every stopping place on the line, to prevent most of those accidents which arise from "run-away engines," "sleeping drivers," "inefficient signals," and "foggy weather." If thought necessary, the same contrivance might serve to open the whistle at the same time, so as to give an alarm. This simple hint, Mr. Editor, I beg to submit to your consideration, and if you should deem it worthy of a place in your valuable journal, I shall feel myself your obliged, as I have been from the beginning, your constant reader.

T. R.

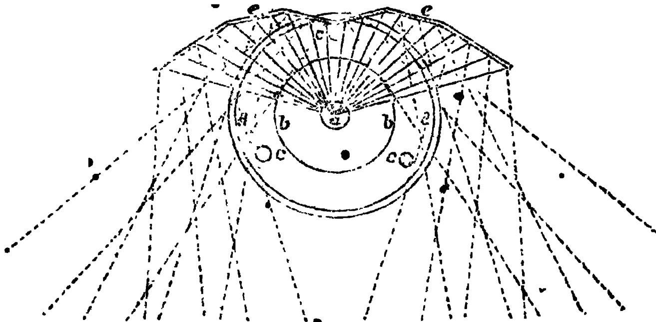
Manchester, Dec. 19, 1840.

[A plan very similar to this has been already patented by Mr. Walter Hancock, though not yet specified. We received also last week, from Professor McGauley, of Dublin, a description of two plans on the same principle, which we shall give in our next number.—Ed. M. M.]

IMPROVEMENT IN THE DAVY LAMP.

(To the Editor of the *Mining Journal.*)

Sir,—I have taken the earliest opportunity my leisure time would permit of complying with your request, and herewith send you the drawings mentioned at the last meeting of the Manchester Geological Society.

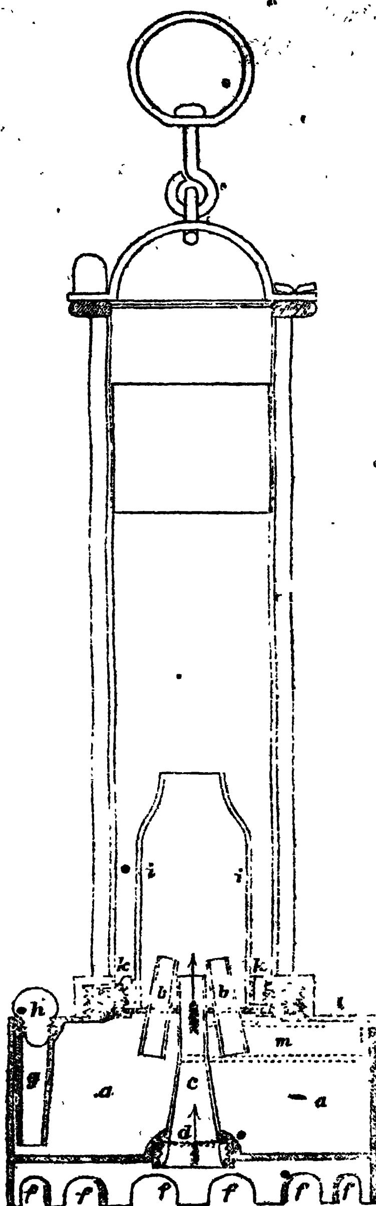


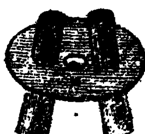
The above diagram represents a plan, or bird's-eye view, of the safety lamp, with the reflector attached thereto. *a* represents the flame in the centre of a safety lamp; *b b* the cylinder of wire gauze surrounding it; *c c c*, three strong vertical wires, between which the cylinder of wire gauze is fixed; *d d*, exterior of the oil cistern; and *e e* the reflector, placed on the exterior of the lamp, made of best block tin, and bent in the form here shown, its inner surface highly polished. It is fixed to the lamp by two small wires, which slide into two small sockets, soldered on the outside of the oil cistern.

The flame occupying the centre of the lamp, the rays of light therefrom flow on all sides equally, so that the miner cannot be benefitted by more than one half of them; but his wish is, that as strong a light as possible should be thrown upon the point he is at work upon—hence the use of the reflector. The rays of light issuing from the back part of the lamp are received on the interior polished surface of the reflector, and by it are thrown forward on each side of the wire gauze cylinder, so that nearly the whole of the light is thus brought forward, and may be thrown upon any particular point the workman may desire.

The reflecting surfaces are constructed in conformity with one of the laws of optics, which is, that the angle of reflection is always equal to the angle of incidence. This will be perceived, on reference to the above diagram, where the strong lines drawn from the centre of the flame represent the rays of light, and the dotted lines are reflections of said rays, brought back on each side of the wire gauze cylinder, no part falling thereon.

Small plates of glass (prepared as for




Perspective view of the double wick tubes and holding plates.

mirrors) placed on each of the reflecting surfaces, the ends and sides fastened by the tin being bent over them, would, I should think, form a good reflector; but whether better than polished tin I cannot venture to say. This reflector will also answer the purpose of a shield, to protect the flame from strong currents of air; and, if found to be of the slightest utility, may be easily added to any other Davy Lamps now in use. It should, perhaps, be mentioned, that the reflector should stand about 4 inches high.

Deficiency of light in the Davy Safety Lamp is the general complaint of the working miner; the adjoining figure is a vertical section of a lamp which, I believe, would materially increase the light without impairing its security. *a a* is the body of lamp or oil cistern; *b b* are tubes for two wicks instead of one, as heretofore; these must produce a larger flame, and will, consequently, give more light; *c* is a tube for the admission of a current of air from below, by which the combustion will be increased; this aperture is guarded at the bottom by one or more small sheets of wire gauze, *d*, which are secured in their position by the hollow screw *e e*. *f f f f f f* are apertures for the admission of air to the tube *c*, should the lamp be placed on the floor of the mine or any similar position; *g* a tube for supplying the cistern with oil, guarded by the screw stopper *h*; *i i* a glass funnel, or chimney, placed within the wire gauze cylinder, and held in its place by the same hollow screw *k k*, which fastens the wick tubes plate; this funnel may be dispensed with or not, at the discretion of the person using the lamp—the wire gauze cylinders and the upper parts are the same as in ordinary lamps; the current of air may be introduced at the upper part of the oil cistern, as at *l* (instead of through the bottom), and be carried from thence horizontally to the tube in the centre, as shown by the dotted lines at *m*.

Should either the lamp or reflector prove to be of the slightest utility, my aim will be accomplished; should they not, they may have the effect of drawing the attention of some one to the subject, better qualified to do justice to it.

I remain, Sir, yours, respectfully,

C. BACKHOUSE.

King-street, Oldham, January 5, 1841.

MOULDING CORNICES.

Sir,—As Mr. Baddeley gave us a good description of casting in Plaster last week, I beg leave to tell you in addition, how to run cornices in plaster, so that the mould shall mitre the angles as the workman goes on. I had more than one thousand feet of cornices run this year with a mould of this description, and it answered exceedingly well. The plan originated with me about seven years ago, while building the Bridge House Hotel for Alderman Humphery, but the opposition of the workmen prevented its employment at that time—trades unions being the evil of the day.

As rooms are mostly at right angles, the workman has only to fix his mould at an angle of 45°, making the allowance for the difference of the moulding, and take it out any where in the straight part of the cornice, when the work is easily made good.

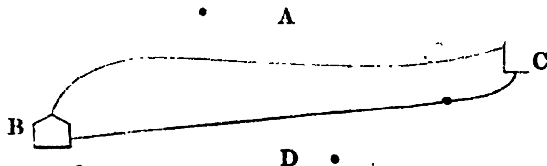
I am, Sir, yours most obediently,

J. WALKER.

December 26, 1840.

ON THE APPLICATION OF THE HOT-WATER SYSTEM, FOR PREVENTING DAMAGE TO CISTERNS AND WATER-PIPES IN DWELLING HOUSES, &c. DURING SEVERE FROSTS.—BY T. N. PARKER, ESQ., SWEENEY HALL.

The following simple experiment was performed in the open air, the weather fine, with a hard frost:—



A leaden pipe, A, of 49 feet 9 inches in length, and ¾ inch bore, was soldered to the top of a closed cast-iron boiler, B, of about ¾ of a cubic foot in dimensions; and at the other end it was soldered to an open cylindrical cistern, C, within 3 or 4 inches of the top, the same being 10 inches deep, and 10 inches diameter.

This upper or ascending pipe, A, was placed on a low wall, rising about 1 inch in 33, added to about 2 feet rise in a quarter circle, adjoining the top of the boiler, and altogether 4 feet 5 inches from the top of the boiler to the insertion of the pipe into the cistern.

A return pipe, D, of ¾ inch bore, and 44 feet 2 inches in length, was soldered into the cistern, about 8½ inches below the upper pipe, and made to descend gradually from thence to its insertion into the boiler, near the bottom, and about 11 inches below the top of the boiler; while the upper pipe was bent outwards to meet the shorter length of the lower or descending pipe at the cistern; but neither pipe was so disposed as to have any dip, or to allow any air to be entangled in it.

On the top of the boiler an open tin can, with a hole at the bottom, was set in putty, for holding a few inches depth of water and a thermometer.

On the heat of the boiler becoming 76 degrees, the pipe adjoining the cistern was warm to the hand, and the water at the top of the cistern had already reached 60 degrees: when the water in the can had attained 108 degrees, the return pipe became warm to the hand near the boiler, and the cistern was at 121 degrees; and lastly, when the water in the can was at 125 degrees, that in the cistern was 145.

There was no ebullition nor overflowing from the cistern, and it is to be observed that after the warm water had got into complete circulation, the temperature in the cistern was greater than in the can.

It would probably have required a much larger fire to make the water boil in the open air, which was unnecessary, because the heat obtained in the cistern was a great deal more than sufficient for the purpose to which I am about to apply a similar apparatus.

A day or two afterwards, the middle part, or about 32 feet of the ascending pipe, A, was placed exactly in an hori-

zontal position, as shown in the preceding wood cut, and the water being warmed again, the alteration in the middle part of the ascending pipe, from a gradual rise of 1 inch in 38, to an exact level, as to 32 feet of its length, did not appear to make any difference in the circulation of the heated water, the rise of the pipe in the whole being 4 feet 5 inches, as before.

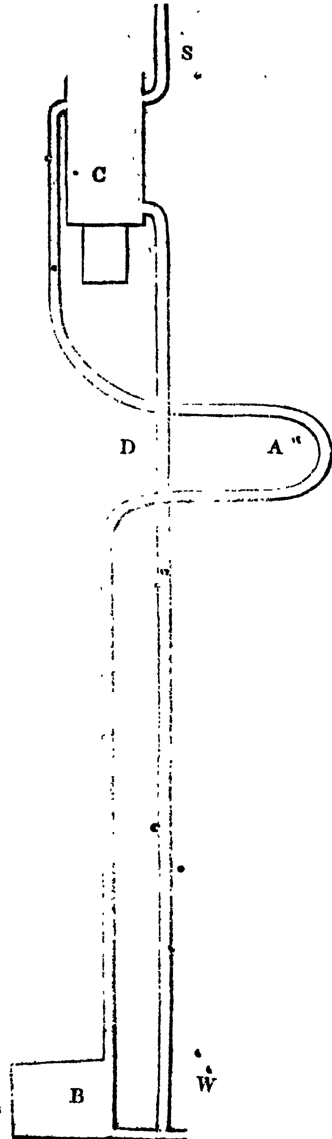
The opposite wood cut will assist in showing the application of the preceding experiment to warming water in the small cistern C, supposed to be furnished with a ball-cock, for regulating the supply of water from the main cistern, in a dwelling house, the main cistern being many feet above the small cistern.

S is the supply pipe; C the cistern; A ascending pipe; D descending pipe; B boiler, and W waste pipe.

The boiler is to be so placed that a fire can be made under it, as occasion requires, and the ascending pipe may be carried upwards, and round a room, passage or closet, at pleasure, till it reaches the small cistern, a few inches from the top; the descending pipe ought to be inserted in the lower part of the cistern, and the lower part of the boiler; the pipes being filled very gradually with water at first, so that no air might be entangled in the pipes.

Since writing the above, I tried this plan within doors, and easily raised the water in the small cistern to the unsuitable temperature of 126 degrees, without the slightest ebullition. I found afterwards (26 February) that with a couple of small faggots, such as are used for lighting fires, weighing 2½ lbs. I increased the temperature 15 degrees, that is, from 40 to 55. It is pretty clear, therefore, that from every pound of dry faggots so employed, which are worth only the trouble of putting them together, about 6 degrees of temperature may be gained. The copper boiler weighs 9 lbs., costs 19s., and contains 2½ gallons; 58¼ feet of ¾ inch lead pipe contains 1¼ gallon, the small cistern 7¾ gallons of water; and 1¾ gallon of open space at the top for expansion, &c.

The ascending and descending pipes at the cistern may be stopped with corks when the severe frosts have gone by till they return again for the winter, whether the water be let out of the boiler or not. A hole of about an inch diameter should be put into the centre of the top of the boiler, and closed with a screw and leather, so that at any time a painter's brush might be introduced for stirring up the sooty sediment, and letting it off at the waste pipe.



Having applied hot-water, to horticul-

tural purposes at least, so long ago as about the year 1801, and ever since watched the slow but sure progress of the invention, I hope, and believe that it will, at no great distance of time, be able to sustain its due rank in the scientific world, far above its present rivals of steam and burnt air; for, however suitable the latter may be for many uses, they are either unwholesome or dangerous when applied to the warming and ventilating of public or private buildings, when intended for human habitation or resort.

The great simplicity of the hot-water system as compared with the mystification of the more complicated contrivances, is, unfortunately, a considerable impediment to its introduction; for few individuals choose to venture upon experiments which require very ponderous materials to be operated upon. It seems also to accord but ill with the interests of iron-founders, to incur much expense in carrying out a plan, which, as soon as completed, might be easily imitated by any one who had once seen it in operation.

IMPROVEMENT SUGGESTED IN SMITH'S PATENT SCREW PROPELLER.

Sir,—The numerous discussions which have, from time to time, appeared in your valuable pages, have induced me to forward you a suggestion, which, in my humble opinion, is a decided improvement on Mr. Smith's propeller. In all diagrams that have come under my notice, the screw is represented as having entirely a plain surface, I propose as an improvement, that the edges shall be corrugated, or crimped thus ~~~~~~~~, verging from the centre, thereby having a greater hold on the water. If you think this worthy of insertion, by so doing you will oblige,

Your very humble servant,

J. JONES, Jun.

Hart-street, London.

MR. HAWKINS'S EVERLASTING PENS.

Sir,—Your correspondent "P. O. P." in your last number, complains of the dearness of my pens, and hints that "if they were sold at, or "something like one-half the present price, I might hope that they would come into universal use."

Now the rhodium pen, which has been sold for many years at 10*s*., has had a very confined sale, as any pen above the price of a few pence must necessarily have; I therefore am not so wild as to hope for anything like universal sale, or even general sale of my pens at 20*s*. each. I know well that mine is not a pen for the multitude. I have not sold 2000 pens in the seven years that I have manufactured them, and had I depended on them for a living, it would have proved a very sorry living indeed. There is no room for doubt but that one of my pens at 20*s*. will outlast 100 rhodium pens at 10*s*. each, or 10,000 of the best steel pens at one penny each; the everlasting pen therefore does not merit the character of a "dear pen"; on the contrary, it is decidedly the cheapest pen ever offered to the public. The love of producing the most excellent article of its kind has been my stimulus, and not the love of gain. I have obtained my end, but have not hitherto had a reasonable remuneration, not having, at 20*s*. a pen, so much profit as is usually obtained by the manufacture of furniture and clothing, it is impracticable to lower the price; indeed, I have often weighed the question of an advance, but have postponed it in the hope that an increased sale would make the pen fairly remunerative. In respect to quality, I do not pretend to excel the best quill or steel pens, although I generally equal such; the occasional sticking into the paper and spurting the ink over, as mentioned by your correspondent, frequently arises from the writer pressing more heavily on one nib than on the other.

If your correspondent will send me his pen, with a description of his manner of holding it, stating which nib he presses the most strongly on the paper, I will make it write more smoothly in that position.

It may be tied on a semi-cylinder of wood fitting the inside of the pen, wrapped up in a piece of paper, and wafered inside the lower part of a letter, in which situation it will not be in danger of being injured by the post office stamp. I will return it by post the day following that on which I receive it.

I am, Sir,

Your obedient servant,

JOHN ISAAC HAWKINS.

Quality-court, Chancery-lane, London,
January 18, 1841.

PLASTER CASTING.—INVALID CHAIR.

Sir,—In the last monthly number of your work I perceive some instructions for taking casts of medals in plaster; perhaps some of your correspondents will favour me with full instructions for making moulds and castings in plaster, from the human figure.

At the same time, I feel desirous of ascertaining, through the medium of your valu-

able work, the best kind of carriage for a delicate boy of 13 years of age, who has lost the use of his legs; it is for general use, and to enable him to pass from room to room, without the aid of another person. Your insertion of this would greatly oblige,

Yours, very respectfully,
H. N.

Rochdale, January 15, 1841.

BLOW-PIPES.

Sir,—Having been a reader of your valuable journal since its commencement, I have been greatly indebted to the various contributions for the information I have received through the medium of its pages. I therefore feel pleasure in sending the following for insertion.

I have occasion to use a blow-pipe to harden drills. As I use near fifty per day I find it detrimental to my health to use the common blow-pipe; I have therefore procured a spirit blow-pipe, which answers extremely well, but is too expensive; I have, on that account, determined on having an oxy-hydrogen blow-pipe, and shall feel obliged to any of your readers who will point out the objections, if any, why the following method should not render the use of these machines safe and without risk of explosions. Instead of conveying the gases through sponge and wire gauze, I propose using in their place small washers of sugar cane packed with common tobacco, with the nozzle of the blowing tube to screw against the washers on a projecting rim in the safety tube.

I am, Sir,
Your obedient servant,
Thomas Kegg.

Leeds, January 11, 1841.

CONDENSATION.—THE PLANS OF MR. SYMINGTON AND MR. HOWARD.

Sir,—As Mr. Howard has not furnished me with the name of his "informant"—as I have proved that although he denied ever having tendered me a public apology, that he did so—as 13 cwt. is more than two-thirds of 18 cwt.—as 14 cwt. is more than two-thirds of 20 cwt.—as he says that at one time he might have been justified in promulgating an error—and as I consider he is labouring under a delusion, I think myself warranted to make a better use of my time, than to go over the same ground again and again, merely to indulge the whim of Mr. Howard. I may, however, just inform him, that Mr. Harrison, one of the proprietors of the *Dragon*, and Mr. Fletcher, the sole owner of the *Fletcher's Dispatch*, have both satisfied themselves that the saving of fuel has amounted to one-third. The *Fletcher's Dispatch*, if I am not greatly misinformed as to her powers, could easily leave the *Vesta* behind her, and Mr. Howard is well aware that any character the *Vesta* may now have for speed, has been acquired since her apparatus in whatever particular it may have been perfect, was removed, as before that was done the *Dragon* passed her on more than one occasion.

Having thus given the names of my authorities, I again call upon Mr. Howard to do the like; for I suspect he has been mistaken in imagining it could have been one of the *leading* Directors of the Peninsular Company with whom he had so extraordinary a communication as that which he mentions.

In conclusion, let me just add that if Mr. Howard be anxious to try the question as to his rights, I have no objection to meet him. His own letters, although not the best, certainly will furnish excellent evidence.

I am, Sir,
Your most obedient servant,
Wm. Symington.

Wangye House, January 11, 1841.

ON ASSAYING COPPER BY ELECTRO-CHEMICAL ACTION. BY MR. R. W. BYERS, F.L.S.

(From the *Mining Journal*.)

Process.—A given weight of the ore (as prepared for assaying by the dry way) is dissolved in an acid (*aqua regia* is the best), evaporated nearly to dryness; redissolved in water, filtered, and then treated as the copper solution, I shall describe a little further on. I may remark, I have precipitated the copper on gold and platinum, and adopted various forms, particularly the helix, which I used more than two years, but I find copper cylinders answer better, and there is little trouble in cleaning them, compared with the more precious metals. I feel warranted in saying I have tried hundreds of samples, and have never been deceived by the process—that cannot err; but error may arise from not having a perfect solution, and in the manipulation of the ore, before it is subject to the electro-chemical action.

Now for the demonstration, and which is a beautiful proof of the correctness of the atomic theory:—Take 250 grs. of the crystallised biper-sulphate of copper (or half the quantity), which contains 64 grs. exactly of pure copper, dissolve it perfectly, add two or three drops of acid, and place it in an unglazed earthen pot, which will hold three fluid ounces; place this in another somewhat larger, glazed, in which there is a weak solution of hydro-chloric acid; introduce a copper cylinder (to which a wire is soldered, and whose exact weight is known) in the copper water, and an iron cylinder (with a

wire attached in the same manner) in the latter vessel of acid and water; amalgamate the ends of the wires with nitrate of mercury, and connect them in a cup of the same metal, or in any way, so that they are in perfect contact. As soon as the circuit is perfected, the operation will commence (and which may be known by a slight hissing sound), and will not cease until all the copper is precipitated on the copper cylinder, and which may be effected in the space of from 10 to 12 hours; then take out the cylinder, dip it in water, dry and weigh it—its increase in weight will be the per centage of the copper, and, in this case (for half the quantity), it will be 32 grs. heavier than it was before. The operation, when completed, can be known by taking one drop out of the solution and placing it on pure gold, or platinum, and touching it with a zinc rod—if no copper be precipitated on the gold, the solution will be free from copper. Thus, then, may every one interested in the produce of copper know the exact per centage of an ore, according to the sample. So beautiful and perfect is this system, that one might swear (not speaking profanely) to the produce of a sample, provided all the previous operations were performed with accuracy. By the dry assay there is considerable loss, and which I have proved by "check samples," on many occasions varying from $\frac{1}{8}$ to $\frac{5}{8}$ per cent., and yet the miner must sell by the dry assay; and any one connected with the sale of ore knows (especially in those of low produce) what a difference one-half per cent. makes in the price. Should this loss, in the dry way, be doubted, get some old pots from an assay-office, and test them, or try the slags after the "prill" of copper has been extracted—in both, copper can be traced. A word on these Cornish pots (although the best of crucibles for certain purposes)—they are greater robbers of the miner, from their roughness, than ever the furnace is to the smelter. The former loses all that is absorbed—the latter gets it when the furnace floor or hearth is broken up; and as to volatilisation, more is carried up the assay-office chimney (in proportion) than ever ascended through a furnace stack.

I think I have shown that a perfect mode of assay can be effected, and let no one doubt of success. Cleanliness and accuracy are required in both plans—but, in the dry way, much labour (and hot work too) practice, and experience are necessary to know "fine copper;" but, by the process I advocate, the copper, by an unerring law, is made fine, and requires neither judgment or practice at all, and yet must be correct.

Tremadoc, near Carnarvon, Dec. 28.

[Since the publication of the preceding paper the following communication has appeared in the same journal from an old and esteemed correspondent of our own, Mr. Martyn J. Roberts.]

To the Editor of the Mining Journal.

Sir,—I notice in your journal of the 2nd inst. a communication from Mr. R. W. Byers, on a new mode of assaying ores by galvanism, and in which he gives me credit for "the first idea" of this discovery. Now, in justice to myself, I must state, that not only did I give Mr. Byers the first idea, but a full explanation of this method, my own apparatus for effecting it, and, at the same time, furnished him with details essential to success in this new process, which he has omitted in his communication; and as the subject is of great practical importance, you will, perhaps, allow me to give an explanation of my method in your valuable and widely circulating periodical.

It may be interesting to such of your readers as are unacquainted with electrical science, to know, in the first place, the cause of the precipitation of copper from its ores—and this I hope to show them.

If we take two metals—one being more easily oxidated than the other—and join them together, either immediately by contact, or mediately, by the interposition of a wire, then plunge them into an acidulated solution (such as dilute sulphuric acid), we have a galvanic pair, acted upon, or excited by the dilute acid; the water of the solution is decomposed, its oxygen combines with the metal most easily rusted (called the "pos. pole"), while the hydrogen of the water is evolved at the surface of the other metal (called the "negative pole"). Copper and zinc are two such metals. Zinc is more easily attacked by acids than copper, oxidates more rapidly, and, in the above case, is the positive pole; the copper plate, while in connection with the zinc, is the negative pole, and its attraction for the acid is in a great measure annihilated by its contact with the zinc, and is, of course, thus preserved from oxidation—which fact Sir Humphrey Davy made use of in his endeavours to preserve the copper sheathing of ships.

Now, if instead of dilute acid, as the exciting liquid of the galvanic pair, we employ a metallic solution (say sulphate of copper), the zinc plate of the galvanic pair having a greater affinity for the sulphuric acid of the sulphate of copper, than the copper has for the acid which holds it in solution, abstracts and combines with this acid, while the liberated copper is thrown down upon the negative pole, which in this case is a copper plate; but it may be of any metal having less attraction for oxygen than zinc—such as iron, gold, silver, platina, &c.—and it is an axiom in electrical science, that when a metallic solution is acted upon by galvanism the acid goes to the positive, and the base to

the negative pole. Thus, then, we see in what manner the copper is thrown down. But there is a point of great importance which calls for particular explanation, yet, in Mr. Byers's communication, it has been entirely overlooked. I mean the question as to what metal must be employed as an oxidable plate, or positive pole, in a galvanic pair, for the essaying of ores.

When an ore has been dissolved by an acid we have a metallic solution, not of one metal only, but it may be of several. In the case of most copper ores, there is no doubt but that we should have a solution of iron as well as a solution of copper, and, unless the principle of my process be fully understood, much error may arise. For instance, should zinc be used as a positive plate, the galvanic action would throw down upon the negative pole all metals that have less affinity for oxygen than zinc, and, as iron is one of these, iron would be precipitated on the negative pole, and the result fallacious, as an assay of the quantity of copper in the ore. We must, therefore, be careful in all essays to form our positive pole of that metal which is next in affinity for oxygen to the metal which we wish precipitated on the negative plate, and by adhering to this rule, we may successively discover all the metals contained in the dissolved ore. I shall give an example. I have an ore dissolved which I suspect to contain iron, copper, and silver. The affinity of each of these metals for oxygen stands in the order in which I have placed them—iron having the greatest. To discover what quantity of silver may be in the ore, I form a galvanic pair of a silver and copper plate—the silver being the negative and the copper the positive pole—and immerse it in a measured quantity of the ore in solution. To ascertain the quantity of copper, I take another measured portion of the solution, and immerse in it a galvanic combination of copper for the negative, and iron for the positive pole, for iron being next in affinity for oxygen to the copper sought in the solution, my copper is now thrown down. To find what iron may be contained in the ore, I take another portion of the solution, and in it immerse a galvanic pair, consisting of iron and zinc (zinc having a greater affinity for acid and oxygen than iron has), and of course the iron in solution would be thrown down on the negative plate.

In addition to, or, rather, in correction of, the details of these experiments given by Mr. Byers, I should add that, instead of using an unglazed, porous cup, or division between the plates of the galvanic pair, I prefer employing a bladder, because it is more easily obtained by workmen; and, in some cases, there is an objection to porous earthenware, the metal precipitated being apt to deposit itself in the substance of the ware; but in the tissue of the bladder no such deposit need be apprehended. And, again, it is also far better to avoid the use of mercury, in making the connection between the metals, as described by Mr. Byers; but to make short of a long story, I shall describe the last method—let us say, for discovering copper:—Take a plate of thin copper, bend it in the form of a cylinder two or three inches long, and one or two inches in diameter, open at both ends; make a small hole in the plate near to one end; take a smaller-sized cylinder of iron, solder to one end of this cylinder a copper wire (No. 16) twelve or eighteen inches long, and let the free end of the wire have a screw thread upon it, with a nut or button to screw on (there may be a shoulder on the wire at the bottom of the thread as a stop, or, if the wire be larger than the hole made in the copper cylinder, it will answer the same purpose). Now dissolve your ore with the assistance of heat, filter, and put the solution in an earthen pot (a pint jug will answer), then take your positive cylinder, and put it in a small bladder, together, with sufficient dilute sulphuric, or hydrochloric acid, to cover it; then (first having weighed the copper cylinder) put the screw end of the wire soldered to the iron cylinder, into the small hole in the copper cylinder, and screw it tight on by the nut; then place the bladder together with the iron cylinder, inside the copper cylinder, and plunge both into the vessel containing the dissolved ore; when the action has ceased, unscrew the copper cylinder, weigh it, and its accession of weight will show the quantity of copper in the ore.

Such is the simple and efficacious process which I had the honour of describing some years ago at a meeting of the Royal Geological Society of Cornwall, and which was favoured with the unqualified approbation of the late Mr. Davis Gilbert, and many other scientific gentlemen who were present. It may, perhaps, have been culpable in me not to have sooner given greater publicity to this mode of assaying, so valuable to the miner for its simplicity and correctness; but I may, perhaps, plead as an excuse a long voyage to a foreign country, and much serious illness. However, we have now to thank Mr. Byers for having brought it forward, although he has not exactly given all the credit due to me. Should any further explanation of my process be deemed necessary, I shall always be happy to give it. It is so very simple that the labouring miner can practise it, and he will, no doubt, find it of great assistance in his takings or settings.

I remain, Sir, your's, &c.

MARTYN J. ROBERTS, F.R.S.E.

Hor. Member Royal Geo. Society of Cornwall.
Norwood, Jan. 11.

ON THE PRESERVATIVE PROPERTY OF SULPHATE OF COPPER. BY HENRY WARBURTON, ESQ., M.P.

[We inserted in a recent Number a communication from a correspondent on the application in the mining districts for many years past of the sulphate of copper as a preservative of wood from decay, which was transferred from our columns to the *Mining Journal*. A patent having been recently taken out by a Mr. Margary for this identical application, a discussion has arisen as to the validity of such patent; and among the letters which it has called forth is the following from Mr. Henry Warburton, M.P. Our well informed and intelligent contemporary states that sulphate of copper may be applied to the preservation of wood for one-fifteenth of the cost of the Kyanizing process, and that the French Government are so satisfied of its superiority, that they have resolved to apply it on a large scale at the Arsenal at Rochfort.—Ed. M. M.]

Sir,—Observing in a late Number of your journal that a gentleman has taken out a patent for the use of sulphate of copper, as a preservative of wood against decay, I inclose, for the information of those whom it may concern, an extract from the evidence given by me, in 1835, before the Committee of the House of Commons on the timber duties—of which committee I was a member. The evidence was published about the close of the same year. Besides applying the sulphate of copper as a wash, in the way described in my evidence, in the year 1836, I caused some wood, which was intended for the kitchen floors of some houses I was building on my own property, to be previously soaked in a wooden trough, containing a solution of sulphate of copper. My knowledge of the use of this salt as a preservative of wood against dry-rot, was derived from that distinguished chemist and natural philosopher, Dr. W. Hyde Wollaston. This led me to try the effect of soaking wood in other metallic salts, among which sulphate of tin and sulphate of zinc were found also to answer in preventing the vegetation of fungus.

The following accident which befel a beech tree, growing on the estate of a friend in Hertfordshire, bears some analogy to the ingenious process of Mr. Newall, who avails himself of the ascensional power of the sap, in trees growing or newly felled, for diffusing a metallic solution throughout every part of the heart-wood of a tree. In the county of Herts a black pulverulent peat, highly charged with sulphate of iron, which is dug near Silsoe, in Bedfordshire, is sometimes used as a top-dressing for grass land. A heap of this had been thrown at the foot of a beech tree. In consequence the tree died, and, on felling it, it was discovered that all the heart-wood was of the colour of ink, while the alburnum, or sap, remained of its natural white colour. The tree had absorbed, by the roots, probably, the sulphate of iron, and the oxide of the metal had combined with the gallic acid in the wood.

I am, Sir, yours, &c.

H. Warburton.

London, January 12.

Extract from the Evidence taken before the Select Committee of the House of Commons on the Timber Duties, published December, 1835.

[August 7th, 1835.—Extract from the Evidence of Mr. Warburton, M.P.]

Question 5159.—End of *Answer*.—With regard to dry-rot, very few cargoes of timber in the log come from America, in which, in one part or other of each log, you will not find a beginning of the vegetation of the dry-rot. Sometimes it will show itself by a few reddish discoloured spots on the surface of the log, which, if you scratch with the nail, you will find that to the extent of the spot the texture of the timber, to some little depth, is destroyed; it will be reduced to powder on your scratching it; you will generally see, also, on those spots a white fibre growing. If the timber has been shipped in a dry condition, and the voyage has been a short one, there may be some logs without a spot; still I should think there was scarcely a cargo that came from America in which you will not find many logs of timber thus affected. But if the cargo has been shipped in a wet condition, and the voyage has been a long one, then a white fibre will be seen growing over every part of the surface of every log: and in cargoes that have been so shipped, I have seen all the logs of yellow pine, of red pine, and of oak, more or less affected on the surface.

Q. 5860.—Have you been in the habit of seeing cargoes of timber and deals in the ship's hold?—*A.* I have very frequently seen such cargoes in the hold.

Q. 5861.—Did you ever notice that the same white fibrous appearance which you have described as so frequently visible on the American timber and deals also extends itself over every part of the ship?—*A.* It may; I never noticed it: I think it very likely that it would. *It is easily prevented from injuring the substance of the ship's timbers.*

Q. 5162.—Do you know whether that ends in the decay of these parts?—*A.* If the ship is built of good, sound, well-seasoned heart of oak, I question whether it would affect it. But, in order to prevent its doing so, the precaution is usually taken, I believe, to scrape the surface, as soon as the hold is clear of a cargo of lumber. Were the cargo not cleared out, and the hold not ventilated, a ship that was permanently exposed to this fungus would, no doubt, be affected. *I had the interior of my ship washed with a solution of sulphate of copper or blue vitriol, to prevent its taking the dry-rot. This metallic salt, or a solution of corrosive sublimate (which is the principle of Mr. Kyan's patent), and, indeed, a solution of several other metallic salts, will completely prevent the rot from extending from the cargo to the ship.*

Q. 5166.—Are you of opinion that if the whole of a cargo of American timber and deals were put into a solution of Kyan's patent, there would be any difference as to the quality?—*A.* A solution of corrosive sublimate may prevent the dry-rot from vegetating, or any premature decomposition or decay of the wood, but it can never change the quality of the wood, nor alter its texture, so as to make that mellow which was rigid and disposed to warp, nor that dense and compact which was light and spongy. * * * *You certainly incur a risk by using timber of that kind* (American red pine), unless a closer examination be made of the surface of each log to be used than most architects or builders are likely to make, *or unless you have recourse to preventive means, such as Mr. Kyan's patent, or some other such mineral poison, may afford.*

MR. SYLVESTER'S APPARATUS FOR WARMING AND VENTILATING.

From the Derby Reporter, Jan. 7th, 1841.

Warming and Ventilating the County Prison.—In another part of our paper our readers will find the Reports of the Visiting Justices and the Surgeon of our County Prison, in which Mr. Sylvester's apparatus for warming and ventilating the gaol is spoken of in terms of high approbation. We have had the pleasure of inspecting the ingenious and scientific arrangements by which this desideratum is accomplished. The sections of the prison are seven, two of which are devoted to the female prisoners; connected with each is an apparatus fed from the outward circle of the prison, from which a stream of hot water is sent through every part of the section, and so equally distributed that each cell receives its proportion of heat, the inmate having the power of opening his window and cooling his room, if too hot, without robbing the supply to the adjoining cells. In each cell there is a grated aperture which admits the warm air, and another which carries it off as it becomes vitiated; this is accomplished by shafts at the top of each section, into which the superfluous heat is thrown, and thereby forming a current so efficient, that the air in each cell is completely changed in a few minutes. This supply of pure warm air must tend very much to promote the health of the inmates of the prison; and if the apparatus had been erected at the time the building was in progress, would scarcely have cost a thousand pounds for a prison which will hold upwards of 200 prisoners. We understand the consumption of coal is about 3 cwt. in the 24 hours for each section, averaging the year, which does not far exceed the quantity which would be used in the ordinary day rooms.

Visiting Justices' Report (Extract).

"It is a source of gratification to us to announce, that the arduous undertaking of warming and ventilating the prison has been successfully completed, and that the apparatus is now in satisfactory operation. We have repeatedly examined carefully each cell, and we may report that the temperature has been what is desirable; and we propose that a further report as to the efficiency of the work at the end of three months more of winter, should be made to the next Quarter Sessions by the then visiting justices, when we have no doubt it will be represented as a master-piece of the kind, and well worthy of imitation."

Surgeon's Report (Extract).

"As the new plan of warming and ventilating the prison has lately been completed, I feel great pleasure in stating that I consider the result of the experiment which has been made upon so extensive a scale has proved most satisfactory, and has tended much to keep the prisoners in a healthy condition.

"It is now between two and three years since the plan was commenced, and during a considerable portion of that time, the warming and ventilating system has been in full operation in parts of the prison, so that my opinion is not formed upon a hasty observation of its advantages.

"As the plan adopted in your prison, under the superintendence of Mr. Sylvester, is new, and certainly the most perfect in existence, I think it may be well very briefly to state that the excellence chiefly consists in affording an abundant supply of warm air, and an effective mode of drawing out the impure air from each cell. With regard to the warm air it is sent into every part of the prison, never having been raised to more than

a very moderate temperature, which prevents the highly injurious effects produced by air having been over heated, for it is found that, where air is raised to several hundreds of degrees of heat before passing into a room for the purpose of warming the atmosphere, affections of the head and chest are almost invariably produced.

"The air thus moderately heated by passing over tubes peculiarly constructed, containing hot water, passes into the cells, and is then removed by means of tunnels so constructed as to draw it out again in a very short time, by which method the air in every cell is constantly changed, and it is kept at a comfortable temperature of from 55 to 60 degrees of heat, and these great advantages are produced by an economical consumption of coal.

"I feel the more anxious to make the above statement, as I am fully persuaded that it is absolutely requisite for the health of prisoners confined in separate cells, that they should breathe a comfortably warm and pure air; if they do not, they will frequently suffer from the ordinary maladies produced by cold or a contaminated atmosphere—or should they even escape the more evident attacks of illness, very many who are imprisoned under long sentences, and especially the scrofulous and feeble, will suffer from a gradual diminution of their vital powers, which will permanently impair their health, and in many instances shorten their lives after being discharged from prison, should they be so fortunate as not to die in confinement.

"DOUGLAS FOX."

PROPOSAL FOR ESTABLISHING A BRITISH ASSOCIATION FOR THE ADVANCEMENT OF THE FINE ARTS.

Sir,—A knowledge and consequent due appreciation of the fine arts,—the arts which purify and ennoble,—are now observable amongst much larger masses of persons in the metropolitan cities of the United Kingdom, than was the case twenty years ago; and must inevitably go on to augment in a greatly multiplied ratio, as every step gained becomes the means of further advances. In the provinces, too, where there are fewer "appliances and means to boot," the attention of the people to the importance of the fine arts as civilizing agents, and as tending to promote the general good therefore the general happiness, has visibly increased, and has manifested itself in more than one good result. Still there is a wide field here open for exertion; and so undeniably important is the object to be attained, so vast is the good that would result from spreading a taste for the fine arts throughout the country, and inculcating a love of the beautiful, that no efforts could be too great, no scheme of operations could be too extensive, which should propose to effect it.

Experience shows the advantages which have resulted from the establishment of the "British Association for the Promotion of Science," not chiefly to science, *per se* although these have been great and manifold, but to the people generally: attention has been awakened in the minds of thousands to subjects before unthought of; a spirit of inquiry has been induced: and whole towns innoculated with an admiration of knowledge, and a determination to pursue it, to the exclusion of demoralizing sources of excitement, until then indulged in. Why, then, might there not be formed an association for the encouragement of ART, which, like this, should meet annually at a different town in England, Ireland, or Scotland, and at which meeting painting, poetry, sculpture, architecture, &c., &c., in all their varieties, and with all their ramifications, should form the subjects for the consideration of the different sections. A large and important exhibition of works of art might be collected, and an Art-Union arranged so as to secure the sale of a certain number of them, and thus to ensure the assistance of the most eminent artists, by rendering the society directly as well as indirectly advantageous to them. A small subscription (say of one pound) would constitute a member of the association for the year, the aggregate of which, after deducting the expenses necessarily incurred, would probably enable the committee (which should be partly local, partly general) to offer prizes for competition in the higher branches of the various arts, and vote sums for the encouragement of any desirable object, in connexion therewith; such, for example, as for the prosecution of experiments in the preparation of colours, the manufacture of stained-glass; or for the purchase of particular pictures, worthy of national regard.

During the meeting the various local collections would be thrown open to inspection; conversazioni would be held; and other means adopted to bring men into contact with each other, on one common ground. One of the first points to be achieved by the united sections would be, to obtain an able and correct report of the progress of Art in England, Ireland, and Scotland, for the last fifty years—a task to be fulfilled satisfactorily only by the joint co-operation of men in all parts of the country. This report would afterwards be continued from year to year, under its various heads, and could not fail to prove a work of the highest interest and value. It is not here attempted, however, to point out what *could* be done by a

society organized on the footing suggested: its power of effecting much good must be apparent to all, and needs hardly to be insisted on. The writer is contented simply, but with great earnestness and but one object,—namely, strong desire to serve the cause of Art (the cause of morality and public good), to state the proposition, in the hope that others of more ability, influence, and leisure, may view it as it has appeared to him; and be induced to carry it into execution, efficiently and forthwith.

GEORGE GODWIN, Jun.

Pelham Crescent, Brompton, Jan. 1841.

SCIENTIFIC COMMISSION—FALL OF MOUNT ARARAT.

At a late sitting of the Academy of Sciences at St. Petersburgh, Professor Parrot delivered the following address:—"The late fall of a considerable part of Mount Ararat is an event of such importance in the natural history of the earth, that I think it right to invite the special attention of the academy to it; and the more so, as the different accounts that have reached us respecting this dreadful phenomenon are very confused, and are at variance with each other. In ancient times, perhaps anterior to all history, a similar fall must have taken place. This is proved by an an immense cavern, on the north-north-east side of the mountain, which is called by the inhabitants the "Dark Cavern;" it begins above, in the regions of eternal snow, and extents downwards to the depth of 800 toises; the circumference must exceed 600 toises. The whole of the interior of this cavern presents almost perpendicular, uneven, and rent surfaces of lava, which give evidence of the operation of a prodigious power. The recent phenomenon seems to have been of a similar nature, but on a larger scale. An accurate examination will certainly procure us important information respecting the nature of volcanoes. The late catastrophe may, perhaps, allow the observer to examine this ancient volcano in its inmost recesses, or at least as far as the channel through which the masses of lava rose and were discharged; the lava must certainly still fill it up to its issue. Its direction upwards will be plainly marked by several indications, especially by little bladders which form furrows in the surface of the lava, and increase in extent as they are nearer to the summit. On these considerations, I propose to ask the consent of the government to the appointment of a scientific commission for the purpose of making an accurate examination of Ararat and the adjacent country. It will be very interesting and important to visit all the places covered with the fragments, and to observe the great detached masses, which will undoubtedly increase our knowledge of volcanic eruptions, their structure, and composition. Perhaps the expedition may find large masses of sulphur, perhaps even openings in the sides, or at the bottom of the cavern, through which the volatilised sulphur escapes, and form such kinds as in the Solfaterra, which would be highly important to Russia. The expedition must obtain as extensive information as possible respecting the various directions taken by the eruption; thus it will be able to discover the focus of these great convulsions, and, at the same time, that of the volcano. It will have to make an excursion into the lofty yet unexplored mountain chain which bounds the rich and beautiful valley of the Araxes, to obtain a knowledge of its nature, which, perhaps, is also volcanic. If the academy approves of my proposal, I will undertake to put together all the information I possess respecting volcanoes, for the purpose of drawing up the necessary instructions, and lay it before the academy." In conclusion, the learned professor regretted that he could not propose his son (professor of Natural Philosopy in the University of Dorpat) to conduct this expedition, as he was then labouring under a serious and dangerous illness. The latter, it is well known, made an accurate survey of Ararat a short time before the late catastrophe, and is perfectly acquainted with the locality.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JAMES HARVEY, OF BASING-PLACE, WATERLOO-ROAD, TIMBER MERCHANT, *for certain improvements in paving streets, roads, and ways, with blocks of wood, and in the machinery or apparatus for cutting or forming such blocks.*—Petty Bag Office, Dec. 2, 1840.

The first of these improvements relates to the form or configuration of the wooden blocks, which this patentee proposes to employ for paving purposes, and of which there are forty views accompanying the specification, but which we could not intelligibly describe without illustrative engravings. The second improvement relates to the machinery for producing such blocks. A cranked axle revolves in plummer-blocks, supported centrically by standing upon a strong cast iron frame; two pair of connecting rods are jointed to two cross heads, which work in horizontal guides, one on each side of the shaft. At each end of the machine a stationary knife or cutter is fixed, before which there is a table; the two cross heads move to and fro within a short distance of the fixed knives. A block of wood being placed upon the table, and motion communicated to the

main shaft by any convenient means, the cross head strikes the block and forces it up against the cutter, whereby it is cut partly through; on the retrograde motion of the cross head another block of wood is placed upon the table, which, on the return of the cross head by the next revolution of the crank shaft, is driven forward, by which means the first block is completely, and the second block partly, cut through. Each block is finished upon the introduction of a second, and this operation proceeds simultaneously at each end of the machine.

The inventor does not confine himself to the shape or construction of the stationary cutter (as that must always necessarily depend on the form of block required), nor to the method of working the apparatus horizontally; but he claims—1. The shapes or configurations of all the blocks, shown in the drawings annexed to the specification. 2. The application of a stationary knife, or cutter of any shape, in connection with the machinery described, for the purpose of cutting blocks of wood for paving roads, &c., in whatever manner such stationary cutter may be applied.

Samuel Salisbury Egales, Liverpool, Engineer, *for certain improvements in obtaining motive power.*—Petty Bag Office, Dec. 2, 1840.

The "motive power" proposed to be obtained by these notable "improvements," is to be applied to the propulsion of vessels, by the aid of the following arrangement of mechanism:—Two parallel cylinders lie horizontally lengthways of the vessel, open at both ends, the one end of each passing through the stern of the vessel below the water line; in front of these, and directly in a line with them, there are two steam cylinders, open at one end. The pistons of the steam cylinders are connected by long piston rods, with other pistons in the open or propelling cylinders; on the inner edge of each piston rod there is a rack, which takes into a horizontal spur wheel, so that one piston being forced outwards by the steam admitted behind it, the other has a reverse motion communicated to it by the toothed wheel and rack. The motive power is an atmospheric steam engine, the two steam cylinders being so arranged that the opening of the steam valve of one cylinder opens the eduction valve of the other, and *vice versa.* On one of the pistons being forced outward by the steam, the body of water that has flowed into the open ended cylinder is forcibly ejected at the stern of the vessel; the resistance of which water against the piston will (*it is said*) cause the vessel to be propelled in the opposite direction.

"With this apparatus," observes the patentee, "a saving of 53½ per cent. is obtained—viz. 33½ per cent. by dispensing with paddle wheels, and 20 per cent. by the non-employment of cranks"! *Credat Judæus.* Of the absurdity of such a scheme, we fancy among "engineers"—the class to which the inventor professes to belong—there can hardly be two opinions.

Charles May, of Ipswich, Engineer, *for improvements in machinery for cutting and preparing straw, hay, and other vegetable matters.*—Enrolment Office, Jan. 6th, 1841.

The first improvement relates to chaff cutting engines and provides for certain alterations of speed according to the nature of the work to be performed. In this arrangement the fly-wheel is not placed on the worm shaft as is usual, but is carried by a separate shaft, on which there are a series of toothed-wheels according to the number of speeds that are likely to be required. Another corresponding series of toothed-wheels is placed on the worm shaft, which gear into the former, the largest of the one series being opposed to the smallest of the others, and so arranged that when any two are in gear, all the rest are out. The speed is to be varied at pleasure by a sliding movement, which changes the gearing from any one pair of wheels to any other pair of the series.

The second improvement refers to a novel mode of laying hay, straw, &c., ready for cutting; a series of rollers, consisting of four pair is employed for this purpose, each pair moving more rapidly than those behind them; seven of these rollers have spikes on their circumference, the eighth roller is perfectly plain, and is connected by an endless web or band with another plain roller. The straw, hay, or other matters to be operated upon, are thrown promiscuously upon the endless web, when they are drawn forward by the revolution of the rollers, being combed straight by the spikes on the surfaces of the rollers as they pass between them, and is finally delivered at the end of the machine, between guide plates, nicely arranged in readiness for entering the cutters.

The third, is an improved mode of applying the presser plate to chaff-engines; instead of being fixed to the bar or bridge of the frame, in this case it is fitted to the axis of the uppermost feeding roller, and kept down by a pair of springs pressing against each other, so as to give greater uniformity to the layer or wad as it approaches the cutters.

The fourth, is an improvement on the chaff-cutter known in the trade as the "Doncaster engine." The alteration consists in the bevil of the spiral cutter being upwards and outwards, which admits of its being lapped or sharpened, by a metal plate charged with emery or other suitable grinding material.

Fifthly, there is an improved apparatus for grinding, or pounding, gorse, consisting of a circular trough fixed to the lower part of a vertical revolving shaft, near the upper end of which there is a horizontal plate. A series of stampers are so adjusted with inclined planes on their upper ends that the revolution of the shaft and horizontal plate, gives them an up and down motion. To each of the stampers a cord is attached communicating with a spring on the rotary shaft, so that a rotary as well as an up and down motion is given to the stampers, which effects the grinding and pounding of gorse, or any other vegetable matters placed in the circular trough for that purpose.

The claims are,—

1. The mode of constructing chaff-engines worked by two feed rollers, and driven by a worm by applying a change of motion thereto.

2. The mode of laying straw, hay, and other vegetable materials, longitudinally and even by drawing out and combing.

3. The mode of applying the presser-plate to chaff-engines by a movement independent of the upper feed roller.

4. The mode of applying spiral cutters to chaff-engines, and also the method of grinding or sharpening the same.

5. The mode of preparing gorse by a machine, by means of a circular revolving trough and stampers.

Edwin Turner, of Leeds, Engineer, *for certain improvements applicable to locomotive and other steam engines.*—Roll's Chapel Office, Jan. 6, 1841.

These improvements consist in certain modes of feeding steam engine boilers, with water, through a series of tubes forming the fire-bars of the furnace. In the case of a locomotive engine, two longitudinal tubes conduct the water from the tender, whence it is drawn by means of pumps, and forced into a transverse tube which forms one end of the fire-bars, and is a main to which all the other tubular fire-bars are connected, their other ends opening into a corresponding transverse tube placed opposite to the former. The water thus acted upon by the pump is forced through all the tubes forming the fire-bars, and in its passage through them becomes so heated as to enter the boiler in nearly a boiling state, by which means a great saving of fuel is said to be obtained.

The claim is to the method of supplying the hot water for feeding the boiler of a steam engine, either locomotive or stationary, by the means described, of passing the water through tubes, constituting the fire-bars of the furnace.

James Roberts, of Brewer Street, Somers Town, Ironmonger, *for improved machinery or apparatus to be applied to the windows of houses or other buildings, for the purpose of preventing accidents to persons employed in cleaning or repairing the same; and also for facilitating the escape of persons from houses, when on fire.* Rolls Chapel Office, January 18, 1841.

The improved machinery or apparatus, to be applied to the windows of houses for the purpose of preventing accidents, as set forth in the title of this patent, consists of three distinct constructions of machinery. The first is adapted to windows when they require cleaning or repairing on the outside, in order to prevent the person employed in such operation from accidentally falling, and thereby receiving injury. A bracket frame, has two side bars connected by a rod at their outer ends; the inner extremities of these bars are formed into hooks, which are intended to be attached to eyes fixed in the sill of the window. A short distance within the hooks there is a wooden cross-rail affixed to the under side of the frame, which bears upon the outer edge of the window sill. When this frame is affixed by the hooks and eyes to the window, a rectangular box is placed upon it; two studs with eyes upon the upper surface of the side bars of the bracket frame, pass through two holes provided in the bottom of the box, and are there secured by two spring bolts. The top of the box, which is attached by hinges and side quadrants, is then to be raised, when a person may safely stand upright within the box to clean or repair the windows, being securely supported by the bracket frame. When done with, the spring bolts being withdrawn, the box can be removed from the frame, and the bracket being unhooked from the window-sill, may be placed in the box, and the whole carried away without difficulty. We cannot help observing that this apparatus seems to us greatly inferior to the ingenious *window cleaner and fire-escape* of Mr. John Gregory, described in our 26th vol., page 10.

The second contrivance is, a portable apparatus by means of which (it is said) communication may be made from the ground through a window, to persons confined within a house on fire. This apparatus is a system of jointed rods, connected together on the principle of what is commonly called "the lazy tongs;" and when put in operation, raises a strong hook fixed at the extremity of the rods into any window of a house, which hooking on to the window-sill holds the apparatus securely, allowing persons to ascend or descend by it as a ladder, or by means of a basket attached to the end of a rope passed through a pulley, affixed to the top of the apparatus, which enables persons to be assisted in their descent without the least danger of falling. One of the end rods, or first lever of the series, is prolonged so as to

form a handle by which the apparatus is expanded or collapsed, the fellow rod, or opposite lever, is furnished with a spike and a stirrup iron at the lower end. On placing this spike in the ground, and forming a resistance by putting his foot in the stirrup iron, the man grasps the top of the second lever with his left hand, depressing the first with his right, which expands and elevates the apparatus, causing the hook to enter one of the windows. A pulley attached to the upper lever, just below the hook, carries a rope, and when a proper purchase is obtained, a basket, cradle, or other receptacle may be thereby raised, to receive the persons desirous of thus escaping the threatened danger. A semicircular arc, having a series of ratchets cut on its outer edge, is attached to the first lever, passing through a socket formed in the side of the second lever, on which there is a click, taking into the ratchets, to prevent the levers from collapsing, and to retain the apparatus at any altitude to which it has been raised. Of all the numerous plans for pressing the "lazy-tongs" into the fire-escape service, we do not remember to have seen a ruder scheme than the foregoing. Some better plans were recently rejected by the Society of Arts, whose committee of mechanics, took the trouble to draw up a paper, containing a demonstration of the *disadvantages* of a certain construction of fire-escape which several inventors had adopted; viz. a series of crossed levers resembling the instrument called '*lazy-tongs*.'"

The third construction of machine consists of a compact apparatus for facilitating the escape of persons from houses on fire, and may be contained in a dressing or other table usually placed in bed rooms. When the fire-escape is required to be used, the top of the table is opened or removed, and the apparatus applied to the inside of the window, against the sides of which it is readily secured; and persons may with the greatest safety be lowered to the ground or raised therefrom by parties below, in order to assist in rescuing the inmates or furniture of a burning house. The apparatus consists of a square iron frame, forming the entrance to a canvas trough; when not in use, the whole shuts up into a receptacle provided in the top of a dressing table or other similar piece of furniture. For use, the table top is opened, and the canvas trough thrown out of the window, when elongations of the iron frame take into suitable bearings within the sash frame, to secure and steady the apparatus. Descent is then to be effected, by the aid of a knotted rope hanging down within the trough, by a ladder of ropes, of ropes and wooden rounds, or of metal rings 6 inches in diameter, connected together by ropes or links. In some cases, for the sake of increased strength, the canvas trough is enclosed within one of netting; and in order to protect these materials from flames issuing from lower windows, it is proposed to saturate them with a solution of alum, or other anti-combustible agent. If the practical test of successful employment for upwards of half a century may be taken as a just criterion of the merits of this invention, its value is great indeed. This plan has been used in several towns on the continent *for more than fifty years;* it is now and has long been constantly employed in Paris, and has been exhibited, sold, and used in London for more than thirty years. The mere *stowage* "in the top of a dressing table," therefore, is all that this patentee can establish any valid claim to the exclusive monopoly of—with which we wish him every success!

JOHN COX, OF IRONMONGER-LANE, CHEAPSIDE, CIVIL ENGINEER, *for certain improvements in the construction of ovens applicable to the manufacture of coke and other purposes.*—Enrolment Office, Jan. 19, 1841.

The coke oven is a close vessel, of any suitable form, shape, or material; but is preferred to be made of the best Stourbridge clay fire bricks, put together with joints of the same clay. If the object is only to produce the best coke, the oven being heated in the usual manner, is charged with coal and the door properly closed; the gases and products of distillation pass off through any convenient aperture, when atmospheric air is admitted to them through small openings, for the purpose of promoting the combustion of the inflammable gases and the creation of heat, in a wide shallow flue, made as thin as possible, and carried over the crown of the oven. The heat thus created is thrown down upon the charge of coals contained in the oven, and continues the coking process. If it is required to make this heat available for other purposes, besides the production of coke, part of such distilled inflammable products only are carried through this flue, the other portion being diverted through another channel for other purposes. In some cases a small quantity of atmospheric air is at first admitted into the oven until the charge is thoroughly heated, when this supply is discontinued, and the air admitted to meet the inflammable matters on their escape from the oven. Or, a supply of atmospheric air is admitted into the oven just sufficient for the coking process, and the remainder of the inflammable products are ignited in the flue by the admixture of atmospheric air, as before explained.

The claim is for the creation of heat by the admission of atmospheric air to the dis-

tilled products, and the consequent combustion of the same, on or after their leaving the oven; whether the atmospheric air is admitted for that purpose below, above, or at the sides or ends of the oven; and whether the same be applied to a coke oven for the purpose of coking only, or for any other process. There is also a claim for promoting the process of coking by carrying a flue or flues above or over the oven, whatever may be the shape, form, or material of the coke oven to which such flue or flues may be applied or added.

MOSES POOLE, OF LINCOLN'S INN, GENTLEMAN, *for improvements in fire-arms, and in apparatus to be used therewith.* Enrolment Office, January 19th, 1841.

This improvement, for there is only one, relates to such fire-arms as are fitted with percussion locks, and consists in the addition of a cap or shield to the nipple, for the purpose of preventing the percussion cap from falling off. On the outside of the breech a projection is fixed, through which a hole is drilled to receive the axis of a peculiar formed apparatus or lever which covers and rests upon the nipple of the lock. This shield or lever is turned back when a percussion cap is to be applied and then returned again to its place over the cap. When the trigger is pulled the hammer falls and strikes a blow upon the lever or shield, which transmits the blow to the percussion cap and so fires off the charge. By this arrangement all danger from the particles of the exploding cap is avoided, nor can the expended copper cap get into the hammer or stop there.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for October, 1840.]

METALLIC COVERING FOR THE ROOFS OF HOUSES; *Peter Naylor*, Sept. 11.—Bars of metal are to be attached to the rafters, and these bars are to be so bent as to form a succession of arches, or elevated ridges, to which metallic plates are to be riveted, in a particular manner. Thin bars of metal, placed edgewise, are to extend along these ridges, and the plates of metal used must be of sufficient width to extend from one of these thin strips to another, and so as to lap over, and to be riveted through them.

The claim is to "the plan of constructing a metallic covering for roofs, is the manner of connecting the edges of the respective sheets together by lapping them upon, and riveting them through the bars of metal, whether placed upon arch pieces as first described, or directly upon the timbers, sheeting, or planking, or raised therefrom by battens, or strips of wood, or in any other way, whilst the construction and use remain substantially the same with those herein made known."

LOCKS FOR BANKS, &c.; *William Stillman, Sept.* 14.—This lock is so constructed as that the continued action of two keys is required to shoot the bolt back and forth, there being, of course, two key-holes. The keys act upon opposite sides of the bolt. There are, also, to be what the patentee calls stoppers, within the lock, the nature and object of which we shall not take the time to describe, as it would require more space than we think proper to devote to it. The keys are of the ordinary kind, and the invention, we are apprehensive, is not such as to compete with locks previously in use, where special security is required. The claim does not designate the nature of the invention.

APPARATUS FOR MAKING KNOWN ANY DEFICIENCY OF WATER IN A STEAM BOILER; *William H. Hale, Sept.* 14.—This invention is intended for the purpose of sounding an alarm by the escape of steam through a tube, when there is any dangerous deficiency in the quantity of water in a boiler. Said tube leads into a metallic box, containing fusible metal so arranged as that when the metal melts, the steam in the boiler can escape through an alarm tube. The particular arrangement made for this purpose forms the subject matter of the claim.

A MACHINE FOR SETTING SAWS; *Joseph Beach and David Culver, Sept.* 20.—The saw to be set is placed between two bars of iron, and wedged in place, with the teeth projecting over a bead along the lower bar. The setting is to be effected by means of a hammer and punch. The claim is to this arrangement.

A MACHINE FOR SETTING ELLIPTIC SPRINGS; *George J. Neveil, Sept.* 20.—This machine is for setting the plates of elliptic springs to the proper curvature; this setting is effected upon a bed of cast, or of wrought, iron, the upper surface of which has the ordinary curvature to be given to the spring, but for the purpose of increasing the curvature, the bed is divided into two parts by a cross section at its middle, and by raising this part whilst the ends are kept down, the set of the spring will be increased. The setting is effected by means of two rollers, which are attached to arms of the proper length, and working on joints below the bed, which arms may be raised or lowered when required. The steel to be bent is heated, laid upon the bed, and held down, when the rollers are to be passed over its surface.

The claim is to "the combination of the two beds, or forms, regulated as described, with the rollers attached to the levers, and governed by a lever and springs, for the purpose and in the manner set forth."

IMPROVEMENTS IN THE MACHINE FOR

MANUFACTURING PAPER; *William Knight, Abijah L. Knight, and Edward F. Condit, Sept.* 25.—"In this machine, the paper is formed upon a revolving cylinder, the construction of which is similar to that of the cylinder now in use, but it is made considerably larger in diameter than those generally employed, and the paper stuff, or pulp, is applied to it in a manner different from that used in the other cylinder machines." The pulp is supplied from a pulp box, above the cylinder, and is fed to it through a gate, properly regulated. It is led off from the first cylinder, and passed between pressing rollers; and from these conducted around and between a succession of drying cylinders, usually ten in number, placed in pairs one above the other, so as to operate as pressing, as well as drying, cylinders. There are many points of arrangement which we pass over, and furnish the claims made, which are as follow:—

"We claim the combination of the revolving bands with the cylinder for giving an even edge to the paper at each end of the cylinder, causing, by said arrangement, the said band to revolve by the cylinder itself.

"We claim the running of the paper cylinder upon an independent frame, resting upon rollers on a stationary frame, in such manner as to admit of a vibratory motion being communicated to said upper frame, and the parts appended thereto, as described.

"We claim the combining of the naked wooden roller, with the roller, for the purpose of collecting the broken paper, or pulp, as set forth.

"We claim the arrangement of the drying cylinders in a number of successive pairs, for the purpose of simultaneously drying and pressing the paper, as described."

A STEAM BOILER; *Richard V. De Witt, Sept.* 25.—"*Claim.* I do not claim, as my invention, the placing of a furnace, or of flues, within a boiler, nor do I claim the giving to the flues a scroll like, or spiral form, this having been done in the labyrinth boiler; but I limit my claim to the continuous diminution of the capacity of such a flue, for the purpose, and in the manner set forth, however the furnace may be situated, and whether the combustion be kept up by the ordinary draught, or urged by a fan wheel, or other blowing apparatus."

The boiler upon which this is an improvement, was patented by Mr. Van Order, of Ithaca, New York; his flue was scroll formed, but its section was the same throughout, the sides of the scroll having been parallel to each other. Mr. De Witt says: "but instead of keeping the sides thereof parallel longitudinally, I cause them to approach each other from the point at which the flue leaves the furnace until it terminates in the chimney, so that the space for the gaseous products of combustion undergoes a regular diminution. The object of this gradual contraction of the flue is to compress these products, as the gases contract by their loss of heat, by which contraction said gases are more effectually brought into contact with the walls of the flue than in the labyrinth boiler." [This arrangement was successfully adopted in locomotive and other boilers, by Messrs. Braithwaite and Ericsson.]

SQUARING AND FINISHING THE HEADS OF BOLTS, NUTS, &c.; *John Bellemere, September* 25.—A chuck for a lathe is so constructed as that a number of screw bolts and nuts may be fixed in it, in such a manner as that by means of a slide rest one side of each bolt, or nut, may be turned and finished. The mode of doing this, when once the idea is conveyed, will readily occur to any handy workman.

IMPROVEMENT IN THE CONSTRUCTION OF LIME KILNS; *A. H. Tyson, September* 28.—

Claim. "What I claim as my invention is the introduction of a vertical pipe in the centre of the kiln, for increasing the draught. Also, the introduction of water to prevent the vitrification of the lime, by means of pipes, arranged as set forth. The constructing of the centre grate of the form described, so as to permit the ashes and refuse lime to slide down its sides and pass between the grate bars into the ash pit below. Also, the employment of the inclined doors for the discharging the lime."

The vertical pipe is suspended in the centre of the kiln, and is perforated with numerous holes at its sides, so that air passing into its open, upper end, may be diffused through the lime. This tube, as represented, rises to a small distance, only, above the kiln, and must, therefore, be in an atmosphere of carbonic acid, which would aid but little in promoting combustion.

Through the sides of the kiln there are a number of tubes inserted, which are furnished with stoppers, and through these tubes water is occasionally to be poured, which, it is said, will reduce any vitrified lime to powder, and cause it to fall down, and pass through the grate into the ash pit.

IMPROVEMENTS IN PEN HOLDERS: *William Fife, September* 28.—This pen holder has an awkward appearance when first seen, but it is pleasant in use, affording much advantage in the management of the steel pen. The part which clasps the pen, and which is affixed to the end of the handle, is attached thereto by a slide which is a segment of a circle, of which the point of the pen is the centre, and whatever lateral slope may be given to the pen, its point does not change its place. The slit, as held, always corresponds with the downward stroke of the pen.

The handle is not round, as in the common pen holder, but is made in such form as that where the thumb and middle finger press it in the act of writing, it is nearly flat, and considerably broader than the ordinary handle, and it is otherwise so formed as to be adapted to the fingers, and to take the proper position between them.

The claim made is to "the employment of a segmental piece, in the manner set forth, by means of which the obliquity of the slit may be easily varied in any required degree, whilst the point of the pen will not be thereby removed from its coincidence with the axis of the handle, or with the centre of the circle of which said curved piece is a segment."

[This contrivance seems to be nothing more than the *Oblique Penholder* patented some years ago in this country, by Messrs. Mordan and Brockedon, but not yet produced for sale.]

IMPROVEMENT IN FORCE PUMPS; *Thomas W. H. Mosely, September* 30.—In this pump, when placed in a well, the chamber and valves are to be entirely under water; and there are two rods which extend down from the brake, and are attached to the opposite ends of a vibrating lever with equal arms, to one end of which lever the piston-rod is also attached. The two rods are jointed to the brake at equal distance from its fulcra. By this arrangement, the rods extending down from the brake, operate upon the lower lever by tension, and may therefore be small. There is also a device for letting the water out of the ascending main, to prevent its freezing. The claim is to "the manner in which the rods, operating by tension, are combined and arranged with the lever, the brake, and the piston-rod, so as to actuate a force-pump, situated entirely below the surface of the water in a well or other reservoir; the parts being so arranged in other respects, in the manner set forth, as effectually to prevent the freezing of the water."

PREVENTING STEAM BOILER EXPLOSIONS; *Isaac N. Coffin, September* 30.—"The nature of my invention consists in the so adapting of a float within the boiler to a valve, escape tube, rotary engine, and pumps, as that by the lowering of the water in the boiler, and the consequent depression of the float, a portion of the steam shall escape, and in so doing shall give motion to the rotary engine, and through this to a pump or pumps, for supplying the boiler with water." The claim is to this arrangement.

We believe that few, if any, practical engineers would deem an engine boiler secure from explosion, where the action of a float within the boiler was intended to produce the effects thus anticipated from it.

NOTES AND NOTICES.

Wax Casting.—White wax may be used for taking casts of medals, &c., and can be readily melted over a lamp. The object to be copied is to be very lightly oiled, and enveloped in a piece of paper, which should be tied round the edge with string. By this proceeding we form a kind of rim to the medal. The fluid wax is then to be poured into the cup thus formed, care being taken that no bubbles of air adhere to the medal. It is then suffered to remain not only until it becomes solid, but even quite cold, which will not take place in less time than two or three hours, on account of the wax being a bad conductor of heat. It may then be taken off by gently pulling the wax-cast from the medal. A mixture of equal parts of bees' wax and rosin may be employed for taking casts, and may be used in a similar manner to wax. This composition is used a great deal by the Italians, but care must be taken not to use the mixture too hot. The composition should be melted, and then allowed to remain till the bubbles have dispersed, and till it becomes nearly as thick as treacle, when it is to be poured over the object, in the same way that white wax is used.—*Smee's Elements of Electro Metallurgy.*

Railway Conference.—On Tuesday last a meeting of delegates from all the principal railway companies in England was held at the Queen's Hotel, Birmingham, to consider the best means for preventing a recurrence of the accidents which have lately taken place on railways. A numerous and highly influential body of directors, with some of the most eminent engineers and managers of railways, attended; George Carr Glyn, Esq., chairman of the London and Birmingham Railway Company, was in the chair. The utmost cordiality prevailed, and the strongest desire expressed by all present to adopt every possible means of accomplishing the proposed object. Those who were most conversant with the management of railways stated their conviction that by far the greater part of the accidents that had occurred, were referable to the neglect and disobedience of orders on the part of railway servants; and while some few casualties must be expected to occur in any mode of locomotion, by such immense numbers of persons as are conveyed on railways, it must be to an improved state of discipline and moral responsibility on the part of the men employed on railways that the exemption from accidents must be looked for. In these sentiments every person who delivered his opinion concurred. The deliberations of the meeting lasted several hours, during which time the regulations and signals adopted on all the principal lines were fully discussed. Several appropriate resolutions were passed by the meeting, in one of which it was stated, "that this meeting considers it desirable that there should be an uniform system of signals recognised, and applicable to all railways;" and they recommended a code of rules and regulations with this view to be submitted to the consideration of each railway company. The meeting then broke up, with the understanding that a future conference should be convened whenever it appeared desirable.

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URWIN'S IMPROVED SYSTEM OF WORKING STEAM ENGINES.

Fig. 1.

Fig. 3.

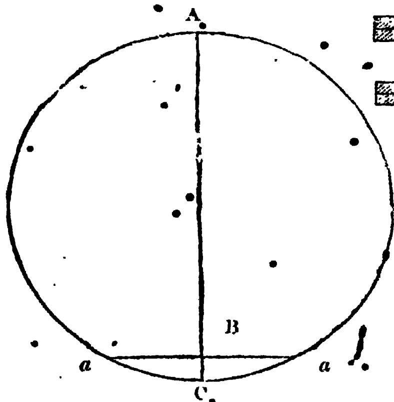
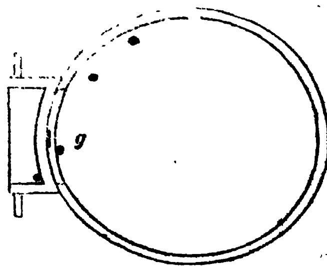


Fig. 2.



URWIN'S IMPROVED SYSTEM OF WORKING STEAM ENGINES.

Among the specifications of patents enrolled during the present week, there is one for "Improvements in Steam Engines," by Mr. Robert Urwin, which seems to us to have a preeminent claim to the attention of the mechanical public. Since the time that Watt, by the invention of the double-stroke engine, doubled the working power of steam, we doubt whether any improvement in relation to this omnipotent agent, has been brought forward, which offers advantages so important as this of Mr. Urwin's, at so cheap a rate—his "improvements" resolving themselves into quite a new system of working the steam engine, by which its capabilities are once more nearly doubled, and which yet requires, in order to give it due effect, only a slight alteration and an inexpensive addition to existing arrangements. Neither do the advantages claimed for these new improvements rest on theory alone, for they have been already applied to a steam tug which is at work on the Thames, called the *Hercules*, of about 70 horses power, the proprietors of which assure us that they have realised, by their adoption, a saving of upwards of forty per cent. in fuel.

In steam engines as ordinarily constructed, a certain quantity of steam is expended in producing each stroke of the piston, up or down, after which it is allowed to escape into the atmosphere, or into a condenser; the present improvements consist, in causing each volume of steam admitted from the boiler into the working cylinder, to produce both the up and the down strokes of the pistons. The engravings on our front page will exemplify the manner in which this novel mode of working is adapted to an ordinary double acting condensing steam-engine.

The following explanation of this new system of working we extract from the ingenious inventor's specification:—

"A, fig. 1, is the cylinder, and B the piston; C D, are the passages for admitting steam into the cylinder at top and bottom, differing in this only from ordinary steam-ways, that the top of the lower orifice D is at a height from the bottom of the cylinder, equal to the thickness of the piston, and about three-fourths of the breadth of the said steam-way in addition. E is the condenser; F an expanding receiver, into which the lower steam-way D opens. G G are two slides, coupled together by means of a stuffing box in the manner represented in the engraving, so that any passage of steam from one side of the stuffing box to the other is prevented; these slides open and close alternately the steam-ways C and D in the usual manner, but subject to certain conditions hereafter explained. Supposing the piston has to make its downward stroke, steam is let in from the boiler to the top of the cylinder, through the steam-way C by the opening of the top slide, and is allowed to flow in unrestrictedly till the upper surface of the piston reaches just below the top side of the steam-way D, on arriving at which point, the upper steam-way C is closed, and as the piston descends past the lower steam-way D, it is opened so as to allow the steam to pass through it from the upper part of the cylinder A, into the expanding receiver F, while a portion of it also rushes beneath the piston through a vertical groove *g*, cut in the cylinder from *a* to *b*, as shown in the plan, fig. 2. This last portion assists in producing an immediate reverse action of the piston, and in carrying the top of it past the steam-way D, as soon as it reaches which point, a passage is opened by the action of the top slide, for the steam remaining in the upper part of the cylinder to pass into the condenser; while, at the same time, the steam which has escaped into the receiver F, rushes back into the lower part of the cylinder beneath the piston, and by its expansive pressure completes the upward stroke. When the piston arrives again at the top of the cylinder, the lower steam-way D is closed by the action of the slides, and a passage opened for the last used portion of the steam into the condenser, while at the same time the upper steam-way C is opened for the admission of a new supply of steam to the top of the cylinder; when the same operation which has been just described, is repeated. And so the engine will continue to work steadily and unintermittingly as long as steam is supplied from the boiler.

"In order to work an engine upon this plan to the greatest useful effect, the receiver should be of a capacity at least one-half larger than that of the cylinder,

but it may be advantageously even three times as large, where saving of room is not an object; and where two engines are employed, as in steam vessels, the two receivers must be in communication with each other. The vertical groove *g*, which admits steam beneath the piston, should be about one-third the area of the steam-way D. The slides must be so adjusted, that the upper one shall travel as much before the crank as to close the upper steam-way C, simultaneously with the opening of the lower steam-way D; for which purpose the top of the upper slide, should be about one-fifth of the breadth of the steam-way C, above that steam-way at the time of determining the length of the slide rod. The face of the top side of the upper slide must also be of sufficient breadth to shut off all communication with the condenser till the top of the piston has in its return stroke upwards, passed the lower steam-way D.

To determine this breadth, the following directions are given in the specification: "Make the top side of the upper slide, always three-fourths broader than the upper steam-way: after this, take a radius of half the stroke of the piston, and describe a circle as shown at fig. 3. Then divide this circle into seven equal parts, next draw a cord from one of them and bisect it, after which draw through the point of bisection the perpendicular A C. Now, assuming *a a*, to represent the space which the crank will travel through in the same time that the piston is travelling from B to C and back again, then the extra breadth allowed on the slide will correspond with the space which the piston has to travel in the same time, and consequently the space which the slides have to travel according to the size of the steam-ways may be readily ascertained. Care must of course be taken to make the breadth of the middle bridge of the lower steam-way D, in proportion to the extra space the slide has to travel. It is also necessary to observe, that the receiver F should have a communication by means of a stop-cock with the steam-chest, in order that previous to starting the engine, when the piston might happen to be at the bottom of the cylinder, steam may be let into the receiver, when it will find its way by the passage *g* under the piston, and by its pressure put it in motion upwards. Instead of a groove *g* being cut out of the cylinder to admit the steam from above the piston to beneath it, an opening of the same area might be made in the piston itself, with a valve to open and shut it, connected with the same motion which opens and shuts the lower steam-way D.

"Again, instead of the piston being allowed to descend past the steam-way D, arrangements might be made, so that in its reaching that point, an opening, or openings should be made for the passage of the steam from above to beneath it, and in that case the steam-way need not be higher up the cylinder than usual. Finally, to the bottom of the cylinder and receiver stop-cocks must be attached, for the purpose of getting rid of any condensed steam that may have accumulated in either, previous to starting the engine."

EVIDENCE OF OUR SENSES.

Sir,—There is nothing more misleading in all philosophy than the commonly received opinion expressed by the phrase "evidence of our senses." It is made use of to express the immediate knowledge of something outside of and beyond ourself, of which one or other of our senses takes cognisance. It implies that our eyes see external bodies, and know them by their colours and forms; that hearing is a faculty of our ears, and sound an external something which our ears hear. But what is the natural fact? Seeing is not a faculty possessed by the eye balls, neither do our ears hear; colour does not belong to anything material, nor has sound any existence outside of our mind. Neither the world, nor anything belonging to it, is to us visible; its substance possesses nothing even similar to our sense-excited perceptions, nor are any of our senses possessed of the faculty of perceiving; they neither see, hear, feel, taste, or smell; and, by their agency, the whole we know informs us only and positively what *does not* belong to matter and bodies—a truth of first rate consequence in philosophising according to Nature.

An external organ, such as the eye, ear, nose, or tongue, and its nerves of sensation, are the whole which constitute the physiology of a sense, so far as perception is concerned. The nerves of

sensation of all the senses are inserted in the brain; those of the eye in the chromatic or colour-exciting organ; of the ear, in the acoustic, auditory, or sound-exciting organ; those of the tongue, in the gustous or flavour-exciting organ of the brain. So if the brain, which is common to the whole of the senses, be deducted, there remain, to constitute any of our senses, only the nerves of sensation and the external organ.

The function of a sense consists in exciting the brain, not in seeing or hearing. The function is not voluntary, but the consequence of the nerves, or rather contents of the nerves, named the nervous fluid, being first acted on by external agency. Thus, by "rays of light" impinging on the retina, the contents of the optic nerve are made to act on and excite the chromatic organ of the brain; by "pulses of air" against the tympanum, the nervous fluid is made to act on and excite the auditory organ of the brain. Similar are the functions of all the senses.

The consequence of the brain being excited thuswise, by the contents of the nerves of sensation of a sense, is the originating a sensation in our mind; which is, that we recognise as luminousness, light, colour, sound, heat, cold, flavour, or odour, according to the sense concerned and organ of the brain excited.

The use of the sensation is to supply us in sensible effects with substitutes for what does not belong to external material nature, and in all cases the sensation seems to ourself to belong to and be a quality of the outward body, which is remotely the cause of the sensation.

Thus far is a brief sketch of the construction and function of our senses. Did the eyes see, the optic nerve exciting the brain would be useless; and we well know that when that nerve or the retina is decayed, there is nothing visually perceived, although the eye balls may be perfectly sane. The eye is but a lens to the optic sense, and is as devoid of sight as a telescopic lens. That hearing is not a faculty possessed by the ear is certain; first, from exciting the brain by the auditory nerve being indispensable to our knowing sound; second, from the consequence of this excitement being productive of the sensation named sound, of which we cannot avoid having immediate knowledge when excited; third, from there being nothing outside the ear similar to a sensation; fourth, from sound being nothing substantive, which decides that there is nothing as sound or noise outside the ear for the ear to hear.

Colour is a sensation equally as sound; both are excited similarly in the mind, and both would be useless, then, did they belong to externals, and did our senses see and hear them. So likewise are heat, cold, flavour, and odour but sense-excited sensible effects or sensations; and as there can be nothing like a sensation but a sensation, it is rationally conclusive that neither luminousness, light, colour, sound, heat, cold, flavour, nor odour belong to matter or bodies.

In being supplied by sensible effects, with qualities foreign to the material world, the wisdom and economy of nature is evident. Were it otherwise, or as is generally conceived, there should be as many different elements of colour as we know by means of a prism; one at least for every different sound; a distinct element for every different flavour and every different odour; whereas by substituting sensations, the whole of the atoms of matter need be but of the same nature. Atomic substance is all required, together with omniscient arrangement, to constitute the mechanical system of nature, to which light, colour, sound, heat, cold, flavour, and odour would be as useless as to a chronometer or windmill.

By the agency of the optic sense we know nothing but colour, accompanied with the idea of form; and from colour being the result of the chromatic organ of the brain having been excited by the contents of the optic nerve, it is evidently a sensation. But we do not recognise it as being within ourself, in the mind or sensorium. It is a law emanating from our wonderful system of mind and organation, that *the sensation shall seem to belong to its outward promoting cause.* Sound we know is not in a bell, nor in the air, yet the sensation in which it consists seems to be external sound, and in being seemingly so, we know in what direction its external cause is situated. From knowing the apparent place of the sensation colour, we have our knowledge of the existence and situation of the different bodies with which we are sur-

rounded; and we imagine bodies are coloured and seen, because that with them we cannot avoid identifying the sensations of colour they are instrumental in promoting in our mind.

That bodies exist outside of us is undeniable, but that they are not objects of perception is made manifest by our knowing nothing by our senses, and by their agency only mental effects. That every object we perceive is what is excited in our mind is evident, from the functions themselves of the senses, and from our having no other perceptions but such as are sense excited.

That our minds' sense-excited perceptions *seem* to be outside of us, and belong to their outward causes but seemingly, is proved by a variety of familiar circumstances. In dreams, a departed friend seems to be before us—seems to be seen and heard; in which case the mental perception is outside of us apparently. With a plane mirror, an image of our face seems to be far behind the glass; with a concave mirror, it seems to be in the air between the glass and spectator. In both instances it is evident there is no image seen; by reason of perceiving or seeing being by the mind only, it is equally evident the image known can be in the spectator's mind only, yet to him it is seemingly before his face. With a shilling on the table, and a convex lens before the lens of our eye, our perception is that which is not before our face, a coin of the half-crown size; with a different lens the object perceived is of the sixpence size: in neither case is the shilling perceived, neither is it altered in size; the changed sensation is the object perceived, and is before our face apparently. So with the naked eye, at all times, the mental effect is the object known; it seems to be the colour of its outward cause; which cause, from having nothing in common with the sensation, colour is uncoloured, therefore is unseen.

From what has been stated—deduced wholly from the natural functions of the senses—it is conclusive, not only that externals are altogether invisible, but they possess nothing whatever similar to the perceptions they promote in our mind; for as we know but sensations, and sensations have no likeness but in sensations, so nothing of the sensible effects—luminousness, light, colour, sound, heat, cold, acidity, flavour, or odour—belong to matter or bodies. Whence, it may be asked, can bodies derive such qualities? Elementary atoms, of which all bodies are formed, possess nothing of the kind, and matter cannot originate any quality not belonging to it naturally, essentially, and unalterably. No elementary writer ever considered any of the foregoing, qualities or properties of matter, yet all impute to bodies, qualities, and properties, the like of their sensations. The consequence is, that modern philosophy is not the philosophy of mechanical nature; it is less physical than metaphysical philosophy.

What our mind knows is the whole we can know—
Its knowledge consists in sensation;
The cause of its knowledge we never can know,
For out of the mind is its station.

Of this we are certain—from this we should reason,
And not let our sensations flatter—
That nothing of all by our senses we know
Belongs, or to bodies or matter.

T. H. PASLEY.

January 10, 1841.

ON THE USE OF THE OXY-HYDROGEN AND OTHER BLOW-PIPES.

Sir,—I hasten to warn your correspondent in No. 911, Mr. Thomas Kegg, against any attempt to apply his sugar canes and tobacco as a safety apparatus in the oxy-hydrogen blow-pipe, lest his ingenuity should lead to his destruction. The oxy-hydrogen blow-pipe is, at best, a dangerous instrument, and I strongly advise Mr. Kegg not to meddle with it; but I will endeavour to explain to him the principle upon which the safety apparatus of this blow-pipe is constructed, and then point out two or three cheaper and safer kinds.

First, then, as to the principle of the safety apparatus, upon which is also founded the construction of Davy's safety-lamp. We may have combustion of two kinds, viz., with, and without flame; combustion with flame requires a very high temperature for its existence, and if the burning body is cooled below this degree of heat, the flame is instantly extinguished. This cooling may be effected by the contact of a body that will abstract the heat,—thus water thrown on a fire expands into steam, and thereby absorbing much heat quenches the flame; or if a body that easily conducts heat, such as a mass of metal, is brought

into contact with flame, the metal carries off the heat, and the ignited matter being cooled below the point necessary for flame, it is extinguished; this may be shown with a minute flame formed by a single thread of cotton in oil, for if we bring into contact with it a bullet, or other mass of cold metal, the light will instantly be extinguished—indeed when very minute, it is destroyed if surrounded by a ring of metal of small diameter. But a more interesting experiment can be made with a piece of wire gauze, having 30 or 40 meshes to the square inch. Hold this flat and bring it down upon the flame of a candle, or better still, upon a burning jet of gas—the flame will not pass through the gauze, in consequence of the cooling power of the metal, which may be proved by continuing to hold the gauze in the flame until it becomes red hot; the burning gas will now easily pass through it; but so long as the metal is moderately cool it may be pressed down even to the base of the flame without any combustion of the gas taking place on its upper surface.

This is a very instructive experiment, for on looking down through the gauze we see the flame to be a hollow cylinder, the interior being dark, and filled with unignited gas. It has thus been shown that a cold metallic surface will by contact extinguish flame; but if these experiments are attempted with a gauze that does not readily conduct heat, the flame will pass through it, and ignite any inflammable body that may be on its upper surface. It is the cooling power of metal that Sir H. Davy applied to his safety lamp, and it is this same power which makes the gauze and wires in the oxy-hydrogen apparatus a protection against explosions, for should the flame be drawn inwards towards the reservoir of gases, it is instantly extinguished by the mass of wires through which it must pass. But there are circumstances under which this apparatus is no longer a security, and Professor Daniels' oxy-hydrogen blow-pipe is safer, for here the gases are contained in separate vessels, and they are only dangerously explosive when mixed. But I again repeat that the oxy-hydrogen blow-pipe, in any form, had better be kept out of unpractised hands, and that a mass of tobacco, or any other body, not a good conductor of heat, is inefficient as a protection against the passage of flame. In the next place, as to the best kind of blow-pipe—if Mr. Kegg desires to have a scientific toy, let him pass a jet of oxygen gas through the flame of an oil lamp; this will give an intense heat, but the manufacture of the gas is expensive, and troublesome unless made on a large scale. As Mr. K. already possesses a spirit blow-pipe, let him use naptha instead of spirits of wine, which is equally effective, and much cheaper; or if he has gas in his workshop, a blast of air from a small double bellows, passing through two or three jets of gas flame, will form an excellent blow-pipe; the jets should be on a line with each other, and the blast passing through all impinge on his drills. This hint may, perhaps, suffice, as he appears conversant with the use of blow-pipes; if it is not, I shall be happy to tell him more,

Remaining, Sir, yours, &c.,

MARTYN J. ROBERTS.

Norwood, Surrey, 25th January, 1841.

OXY-HYDROGEN AND OTHER BLOW-PIPES—HEMMING'S SAFETY CHAMBER.

Sir,—On first reading the communication of Mr. Kegg, at page 68 of your last Number, containing a proposal to construct the *safety* chamber of an oxy-hydrogen blow-pipe "with washers of sugar cane packed with tobacco," I thought he was "poking fun" at us. As there is, however, all the simplicity of earnestness about his communication, I hasten to warn him against carrying any such plan into execution, lest he should prove his own executioner. Unfortunately, the erroneous notion which Mr. Kegg entertains, respecting the action and office of the safety chamber, too commonly prevails; it is looked upon as a sort of *sifting or filtering operation*, instead of what it really is, and must be to prevent danger, A COOLING PROCESS.

The action of the wire gause in Davy's safety lamp is viewed by thousands of persons in precisely the same light as a *sieve*, whereas it is in reality a *condenser*. It is ignorantly supposed, that the particles of flame are of some definite size, and, therefore, like ponderable matters, can only pass through apertures of cer-

tain dimensions; and that, as a sieve prevents the transmission of particles of matter that are larger than the interstices of the wire gauge, so the wire gause of the safety lamp prevents the passage through it of the ultimate atoms of flame, from their being larger than the interstices which it presents to them.

Flame requires a very great degree of heat for its existence, and if that quantity of heat is sufficiently reduced, by the presence of some cold body which will rapidly abstract and carry it off, the flame is inevitably extinguished. The most pleasing and convincing illustration of this fact may be performed in the following manner:—Take a single thread of coarse cotton dipped in oil or tallow, and light it; bring over it a stout metal ring, the opening of which is slightly larger than the diameter of the flame; on placing this ring around the flame, it will be instantly extinguished. Now in this case we have an aperture palpably larger than the flame, and such an one, as for any mechanical impediment, it might readily pass through. The rapid abstraction of heat by the metal, however, below the point at which flame can subsist, causes its immediate extinction. It is the application of this beautiful discovery of the cooling process, as a property of wire gause, by Sir Humphrey Davy, that furnished at once the means of protecting the miner from the dangers previously attending his operations; and also by an extension of the same principle, enabled the extraordinary powers of the oxy-hydrogen blow-pipe to be successfully and safely applied to the purposes of scientific analysis.

The most perfect application of the power of good conductors to the construction of safety chambers for these blow-pipes, seems to be that of Mr. Hemming, for which he received the large silver medal of the Society of Arts, about ten years since. His safety chamber consisted of a brass cylinder four inches long and three-quarters of an inch in diameter, filled with lengths of the finest brass wire. After as many wires as possible had been inserted, a pointed rod was driven down the centre of the mass, which wedged all the wires closely together, converting the interstices between the wires into a very numerous series of minute capillary tubes, four inches in length, which permit the mixed gases to flow through them, but present such a formidable mass of metal surfaces—and consequently of conducting and cooling surface, as most effectually to prevent the transmission of flame. The interstices between these wires are infinitely smaller than the apertures in the very finest wire gauze, and if not altogether, it would be almost impossible, under any circumstances, to force a flame through such capillary spaces.

Although I have been thus explicit, however, I beg to inform Mr. Kegg, that the oxy-hydrogen blow-pipe is by no means adapted to his purposes; on presenting a small piece of steel, such as a drill, to so powerful an agent, instead of hardening it, combustion would instantly ensue.

The best kind of blow-pipe for such purposes is a small pair of double bellows, worked by a foot-crank and fly-wheel, and a tallow lamp—or, what is far better, a gas jet. With such an apparatus, fifty—or even five hundred drills per day may be hardened and tempered with great facility; and the gas flame is preferable to every other, as there is no oxidation or scaling of the drills induced by its action.

I am, Sir,

Yours, respectfully,

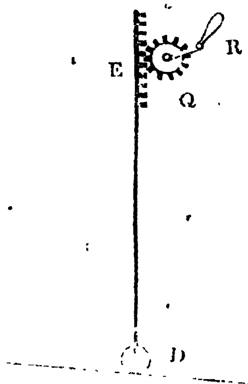
WM. BADDELEY.

DESCRIPTION OF AN APPARATUS FOR THE PREVENTION OF RAILWAY ACCIDENTS — INVENTED BY J. W. M'GAULEY, ESQ., PROFESSOR OF NATURAL PHILOSOPHY TO THE NATIONAL BOARD OF EDUCATION, DUBLIN.

A great number of very terrible accidents have lately occurred on railways, most of these have arisen from the engineer forgetting or neglecting to shut off the steam when the engine had arrived at the end of the line; or from the impossibility of preventing the approaching train from running into that which had been accidentally delayed. On considering the subject, in the hope of devising some means for preventing these tremendous sacrifices of life and property, it appeared to me very possible to construct an apparatus of great simplicity, which would secure the attainment of so desirable an object. The great principle of such an apparatus must necessarily be, the shutting off the steam independently of *any care or at-*

tention on the part of the driver, and even, when required, without *any communication* being held with those on the engine. The application of such a contrivance would contribute more to the safety of the passengers, and would restore their confidence more perfectly, than *any system* of signals whatever. It must consist of two portions, one laid between the rails at the termini, stations, and, I would say, at every quarter of a mile along the line, and capable, except at the termini, of being throw out of action with great facility; it might even be so arranged that the opening of a gate, the withdrawing of a bridge, or, in a word, anything that would render the approach of a train dangerous, might throw a neighbouring one into action, and thus the coming up of a train in such circumstances would be rendered impossible. The other portion must be fixed to the engine itself, being connected with the regulator or valve which supplies steam to the cylinders, and, projecting below the floor of the engine, must, at the proper time, be acted upon by the portion which lies between the rails. A number of contrivances, in accordance with these principles, might be suggested; I shall select only two, divesting them of all technicalities, and paying no attention whatever to the details, mode of fixing to the engine, &c., my only object being to convey a correct idea of this mode of action.

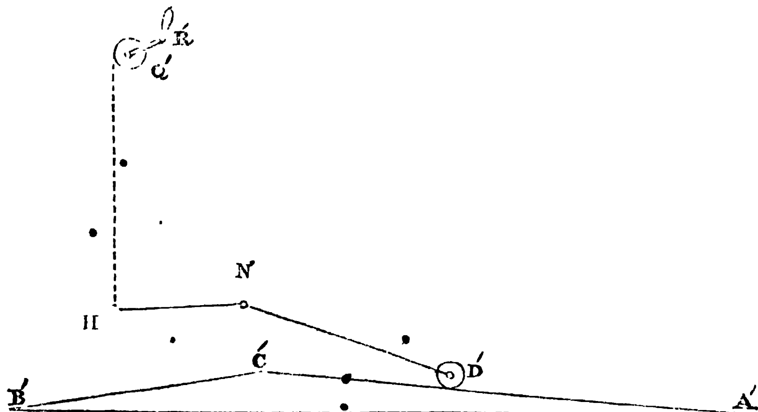
Fig. 1.



Let R, fig. 1, be the handle of the regulator, placed in front of the boiler, and over the furnace door; let a toothed wheel Q be fixed immovably behind it, so that turning either this wheel or the handle will shut off the steam; let E be a rack attached to a rod which projects below the floor of the engine, and carries a roller D. As the engine passes over a thin and sufficiently long inclined plane A C B, fixed parallel to, and between the rails, the roller D ascends A C, raises the rod D E, and the rack E as it ascends turns the toothed wheel Q, and *shuts off the steam* at the proper time, without the slightest attention being paid by the driver. The inclined plane A C being tolerably long, will prevent the motion of the rack E and toothed wheel Q from being inconveniently rapid. It may be thrown out of action by ...g laid on the ground at either side, hinges being fixed at A and B. As already mentioned, it may be connected, though at some distance from it, with a bridge or a gate, &c. Should the least inconvenience arise from the *unexpected* motion of the handle R, when Q is set in motion, it may be so connected by a latchet wheel with the axis of the regulator, that it will allow the motion of Q in *one* direction without being moved itself. The planes of the wheel Q, and of the roller D, will be at right angles, though otherwise represented in the figure.

Or, secondly, let R′, *fig.* 2, be the handle of the regulator; let Q′ be a pulley, to which a chain is fixed; it is to be connected with the regulator in the same way as Q, fig. 1; let the other extremity of the chain be attached to a bell-crank movement D′ N H, turning on N as a centre, and fixed to the floor of the en-

Fig. 2.



gine. While the latter passes over the inclined plane A′ C′ B′, fixed between the rails in the same way as A C B fig. 1, the roller D′ very gradually ascends A′ C′, the point H is depressed, the pulley Q′ is turned round, and thus the steam *is shut off*.

At positions on the line where it might be necessary to turn on the steam again, to bring the train to its proper position, two or three of the inclined planes might be laid down in succession, that the turning off the steam *again and again* might be insured, if necessary. Perhaps, also, in some cases, it might be found more convenient to throw the valves out of action than to turn the regulators, for the purpose of stopping the engine.

It is evident that the apparatus suggested, considering its importance, is extremely simple, and may be constructed at a very trifling expense. Were the inclined planes fixed along the line at convenient distances, and so arranged as to be easily thrown into and out of action, if a train should be in any case unexpectedly delayed, the guard might throw into action the inclined plane next behind, or the engine itself might be made to do this as it passed along, and thus the steam of every approaching train would be thrown off, and due notice would be given of danger being near; or should persons along the line—the railway police, for instance—perceive any cause, on account of which it might be necessary to detain an approaching train, they could arrest its progress with the greatest facility.

LOCOMOTIVE CHAIR FOR INVALIDS.

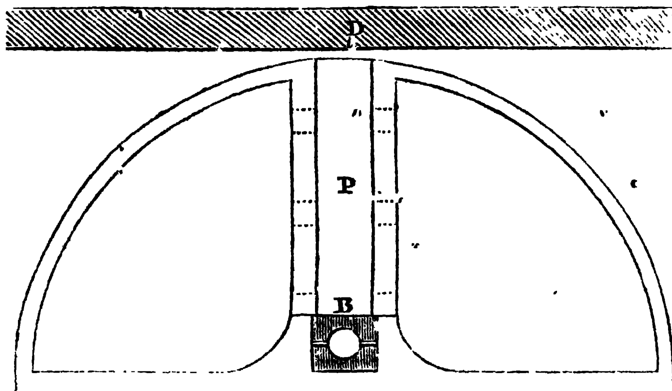
Sir,—I offer my mite to the relief of suffering in the case of your correspondent "H. N.'s" boy. In answer to his question in No. 911, I beg to say that the simplest and cheapest invalid chair for the purpose he requires is, I believe, called "a Merlin." It is a comfortable arm-chair suspended upon three wheels, one of which is in front, turning upon a pivot, with a handle reaching to the invalid: this is to act as a rudder or guide wheel. The chair is supported upon two other wheels, of such a diameter that the upper part of the circumference, or tire, is on a level with the invalid's elbows. To move the chair, let him grasp the upper part of the tire of one of the wheels—by this turn it—and he will thus with trifling exertion, urge on the chair while he guides it with the front wheel. Within reach of the invalid, a board may be fastened by two pins fitting into the sides of the chair, and this will form a desk, or table for his books and tools.

I am, Sir,

Your obedient servant,

M. J. R.

WALKER'S RISING AND FALLING PADDLE-SHAFT.



Sir,—I have been thinking, since I read Mr. Holebrook's paper in your 906th number, on the best means of adapting paddle-wheels to loaded and unloaded steam-vessels, that a plan like the one shown in the accompanying sketch, might be very easily managed, so as to accomplish the required adaptation without altering the diameter of the wheels; bearing in mind, that it is only applicable where there is room under the deck.

D is intended to represent the line of deck, P the plummer block, and B the bearing brasses; the dotted lines show the mortices for moveable wedges.

Let plummer blocks be fixed in the usual way, with the upright long enough to admit of the crank shaft being raised two or three feet if required, with proper mortices eight or ten inches apart, to slide the wedges in under the bearing brasses when raised. Let the top of the connecting rod have corresponding slides, with mortices to fix the brasses when raised, with jibs and keys as generally used · it would also require two large screws, one at each side of the vessel, to raise the shaft to the mortice required, in order to secure it properly with the wedges or any other means that might be considered best. By this means the immersion of the paddles might always be regulated to suit the load line of the vessel, without altering the diameter of the paddle-wheels.

In good hands all this might be easily accomplished at little expense, and retaining strength and stability enough for all purposes. If you think this hint worth a place in your valuable Magazine, we shall perhaps hear more about it from abler hands.

I am, Sir,
Your most obedient servant,
J. WALKER.

Crooked-lane, Dec. 22, 1840.



RESISTANCE OF AIR TO MOTION.

Sir,—An article on "Plane Metallic Surfaces in Number 910 bears so powerfully on my Theory of the Universe, (vol. xxxii, p. 555) that I cannot resist referring to it. "Before they come into contact the upper plate will become buoyant, and will float on the air without support from the hand. (*Note.*--The surface plates referred to were 14 inches by 9 inches, weighing 49 lbs. each.) This remarkable effect would seem to depend on the close approximation of the two surfaces without contact in any part—a condition which could not be obtained

without extreme accuracy in both." Now, as traversing fluids cannot return on their own path, and must pass each other when they meet, the fewer and smaller the interstices—that is, the smoother the surface—the greater must be the difficulty of the escape of the fluids, and, consequently, the stronger the support to the descending surface.

To those who are unacquainted with the force which may be acquired by motion or pressure from the air, the support of such a weight must appear astonishing; but when we consider (as your readers know) that a man by a sudden motion with a sledge hammer acquires a momentary force equal to upwards of a hundred tons, the wonder ceases, or rather is converted into a new channel.

Exactly the reverse of this takes place when (as in an exhausted receiver) the traversing fluids having been expelled, a feather falls as easily as any other substance.

I remain, Sir, your obliged,

E. A. M.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—In consequence of the letter signed "T. R.," dated Manchester, Dec. 19, 1840, and your note immediately following, which appeared in the *Mechanics' Magazine* of the 23rd January inst., I think it but right to inform you, that so far back as the 12th of November last, I obtained a patent, by which I claim (amongst other things,) the cutting off, or regulating, or affecting the steam of a locomotive by means of machinery attached to such locomotive, acting on machinery attached to the line of railway, and that the plan mentioned by your correspondent, "T. R.," is one by which I propose carrying out my invention.

I am, Sir, your obedient servant,

EDGS. BIRCH.

3, Cannon Row, Westminster,
January 26, 1841.

HOWARD'S SYSTEM OF CONDENSATION—MR. HOWARD IN REPLY TO MR. SYMINGTON.

Sir,—A final word or two, if you please, in reply to Mr. Symington's last communication. He states that "any character the *Vesta* may now have for speed, has been acquired since her apparatus, in *whatever particular* it may have been perfect, was removed." This would imply that my condensers (by re-injection) have been removed from this vessel, as well as by the vaporisers, the latter *only* as I before stated, not having perfectly answered. So far from this being the case with the condensers, they have been in conjunction with her boilers (as formerly with the vaporisers in the *Vesta*, the *Columbus*, and the *Comet*,) in continual and successful action, and will shortly be again so on this vessel resuming her station.

As to the other points, the giving up, for instance, of the name of my informant, on the subject of the performance of the *City of Londonderry*, who *is* a leading director of the Peninsula Company, Mr. Symington has rendered this unnecessary, by not even attempting, and so far he is perfectly correct, a *direct* contradiction of my statements. For the rest, I leave the further development of the truth to time, but I withdraw not one particle of my assertions.

I will conclude these remarks, by observing, generally, that any variation in the treatment of the cooling surface, the more especially if such be not *itself* a new method of cooling liquids, cannot affect my patent. Thus the surface may obviously be taken to the cold water, or the cold water to it. Again, as another variety, the water from the hot cistern, or condenser may obviously be made to flow on the outside of the pipes, or other cooling surface, and the cold water within the boiler, the effect being precisely the same as the reverse; and I have in hand a plan by which this arrangement may in many cases be very well applied, and with some advantages. A condenser has been constructed on these works in which either position of the cold and warm water can be made available. A condenser under another arrangement *as to the cooling surfaces*, and not my own design, but of much ingenuity, was some time back constructed by an eminent house (engineers) for their own works, but unfortunately they could not obtain a sufficient supply of cold water, and it therefore lies in abeyance.

Such variations are duly guarded by the wording of my specification, and further, (as Mr. Editor, you have confirmed in some previous remarks from me, in your Magazine, of the like nature,) the patent law has justly provided for such contingencies, but on *this most essential condition*, a condition on which alone I will rely, that the patentee shall have first publicly and practically carried his invention into effect. Were it otherwise, the patent law would be a delusion indeed.

I am, Sir, your most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe,
January 25, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM ASH, OF SHEFFIELD, MANUFACTURER, *for improvements in augers and*

tools for boring.—Petty Bag Office, Dec. 24, 1840.

These improvements consist in the combination of cutters and guides with a shank or spindle. The cutters are rectangular pieces of steel somewhat resembling the cutting side of a centre-bit. The guides are helical pieces on the outside, of various sizes, the interior of which fits the shank or spindle. The spindle has a pointed screw at the end, the size of the thread varying according to the kind of wood to be operated upon; at some distance up, on the side of the spindle, there is a circular stop, there is also a square opening just above the worm, passing through the spindle. The helical guide, of the size required, is first put on the spindle, and a cutter inserted in the square aperture below it, where it is firmly fixed by driving in a wedge. If a larger or smaller hole is required, the wedge is struck out, when the cutter, &c. may be easily removed, and replaced with guides and cutters of the size required. Another form of guide is shown, consisting of a circular plate of metal, with a thimble in its centre, supported by two cross pieces from the outer edge. The first, or helical guide, however, is preferred, from its being longer, and also from its affording a channel for the ready escape of the chips, thereby clearing the hole as the cutter advances.

The claim is for the application of moveable cutters and guides to a shank or spindle, as described.

William Wood, of Wilton, Carpet Manufacturer, *for improvements in looms for weaving carpets and other fabrics.*—Petty Bag Office, Dec. 24, 1840.

The object of the first of these improvements, is to remedy an irregularity which occurs in the present mode of giving the necessary strain on the yarn, while weaving, by means of a weighted cord fixed in a groove formed in one end of the bobbin for that purpose; in this arrangement great irregularity of strain arises as the yarn is used up. The remedy is proposed to be accomplished by passing a metal ring over the thread of yarn under operation, to which ring the weighted cord is attached: this hanging down from the back part, gives a uniform and steady strain to the yarn during its unwinding, the weight gradually decreasing as the yarn is worked up.

The second improvement is for reducing the friction on the axles of the bobbins, and mounting them in the frames so as to work perfectly clear of each other. To effect this object, thin plates of metal are placed parallel to each other, at a proper distance, regulated by the length of the bobbins, provided with suitable openings to receive their axles: the bobbins are ranged in such a manner that the openings formed to receive the axles may intersect each other. The hinder end of the plates is also raised, that the yarn which is wound off the back bobbins may not interfere with the front ones, by which means the bobbins will work perfectly free, without any liability to interfere with each other.

The claim is, to 1. The application of a weighted cord, strap, or chain, directly to the coil of yarn on the bobbin, by means of which, the leverage against which the weight pulls, becomes greatly decreased in proportion as the yarn or thread on the bobbin becomes worked up, and the radius of the coiled yarn reduced.

2. The peculiar method of mounting the bobbins with their axles in metal frames.

William Jeffries, of Holme-street, Mile-end, Metal Refiner, *for improvements in obtaining copper, spelter, and other metals from ores.*—Enrolment Office, Jan. 1, 1841.

These improvements relate, in the first place, to a new mode of conducting the smelting process, by treating the melted ores with carbon or with alkali. A suitable smelting furnace is filled with broken pieces of ore in its raw state, and the heat continued until it has become thoroughly melted: the fluid mass is then charged with carbon, or with alkali in the state of powder (carbon being preferred). The heat is then increased until the mass is again remelted, when the furnace is tapped and its contents run off into cold water, and treated as usual.

Secondly, to obtain the product of zinc ores, heat is applied externally to ovens made of any convenient form, the floor, roof, &c. being made as thin as possible consistent with due strength. It is stated that the floor may be made of bricks three inches thick, while two-inch bricks will be sufficient for the roof and sides. The oven is to be filled with the broken ore, mixed with about 5 per cent. of bituminous small coal, the door shut and closed up with a fine luting. The heat of the furnace being raised, vaporization will ultimately go on, quite as well as when a number of small vessels are used, which has hitherto been the practice. Suitable pipes lead from the upper and lower part of the furnace into reservoirs of water, in which the vapours are condensed, and into which the metal is run when the process is completed.

The claim is, 1. The mode of smelting copper ore, by treating the melted metal with carbon, or with alkali.

2. The method of obtaining zinc from ore by means of ovens.

James Harvey, of Basing-place, Waterloo-road, Gentleman, *for improvements in extracting sulphur from pyrites and other substances containing the same.*—Petty Bag Office, Jan. 8, 1841.

For this mode of extracting sulphur from various substances, two chambers are employed, an upper and a lower one; the latter may be made of metal, slate, or stone, its roof forming the bed of the upper chamber, which is roofed with tiles. A furnace is constructed at one end of the upper chamber, so that the heat may pass along a central horizontal passage, then come back on both sides to the front, and return towards the back at the outer sides of the chamber. Pots of iron, fire-clay, or other suitable materials, formed like the frustrums of cones, with their bottoms perforated full of holes, pass through and are suspended in apertures formed in the roof of the upper chamber, while their lower ends pass through other holes into the lower chamber, the floor of which is covered with a few inches of water. Pyrites, or other substances containing sulphur, are broken into pieces about the size of a man's fist, and placed in these pots, which are then luted down, and the heat of the furnace raised. The sulphur in the form of vapour issues from the perforated bottom of the pots into the lower chamber, where it is condensed by the water, and deposited as flowers of sulphur. When the whole of the sulphur has been driven off, the fire must be slackened, and the furnace allowed to cool; the pots may then be emptied, recharged, and the process repeated.

The claim is for the improved method of subliming sulphur downwards, from pyrites and other substances containing the same as described.

Thomas William Parkins and Elisha Wylde, of Portland-street, Liverpool, Engineers, *for an improved method of making and working locomotive and other steam engines.*—Enrolment Office, Jan. 12, 1841.

This improved method relates to the slide valve and throttle valves of steam engines, and consists in a novel mode of constructing them, so as to facilitate the action of the valves, to place them under more perfect control, and to afford a freer entrance to the steam cylinder under certain circumstances.

The first arrangement is for working the slide valve without the use of eccentrics, in order that it may open almost instantaneously at the time the engine is passing the centre. For this purpose a lever is fixed upon the cross-head working in a link connected to a second lever fixed on a shaft or weigh-bar across the engine, whereby a rocking motion is produced. On the other end of the weigh-bar a double lever is fixed, carrying two studs above and below the centre of the said shaft or weigh-bar, for the forked rod to work upon. One end of this rod is attached by a working joint to a fourth lever fixed on the weigh-bar, which gives motion to the slide valve at each succeeding return of the cross-head to the extremity of its stroke. The levers are so arranged that the slide valve is always kept wide open at the period of the engine passing the centre, instead of being shut, as is always the case when an eccentric is used, and by which means the full effect of the steam is employed up to the last moment.

Secondly, A new method of constructing the slide valve, being an improvement upon the old D slide valve, is described; the object being to get rid of almost the whole of the immense steam pressure which always presses upon slide valves of the present construction, and at the same time to give a free passage for the escape of the waste steam throughout the whole of the stroke. This slide valve consists of a hollow square ring of metal, working between two surface plates, the lower one being the side of the cylinder, the upper one provided with set screws or other suitable means of adjustment. The hollow ring beds upon the cylinder, and is furnished with a square metallic packing upon its upper surface, which, abutting against the adjusting plate, makes the slide valve perfectly steam tight. The slide valve is made long enough for the eduction passage to remain open while the steam way is closed, and *vice versa.*

Thirdly, the patentee describes a peculiar mode of constructing the regulator or throttle valve of steam engines, especially as applied to locomotive engines, so as to afford a ready and convenient means of admitting steam to either one of the cylinders only, or to both of the cylinders at the same time. The regulator or steam passage is in this case a flat surface, with passages through it at the distance of one end of the cylinder from the other, and so disposed that when the regulator's handle is inclined to the starboard, steam is admitted into the cylinder on the larboard side of the engine: on inclining the handle over to the larboard, the steam is also admitted to the starboard cylinder; but on placing the regulator handle in a vertical position, the throttle valve is closed, and the steam communication cut off from both cylinders.

A fourth improvement consists in certain additions to the machinery for working the slide valve, so as to cause the steam to work in the cylinder expansively, in order to economise fuel: for this purpose two slots are made in the top of the link in which the cross-head works, in which two bell-crank levers work on pivots; to the under side of the engine framing a roller is fixed between the two levers, being a fulcrum to act against when they are alternately pressed down by the roller (attached to the lever on the cross-head), which works in the link passing over them; this causes the link to advance sufficiently to close the slide valve, or, in other

words, to shut off the steam at the determined portion of the stroke.

Finally, an arrangement is exhibited for reversing the direction of the steam, so as to stop the engine and drag the wheels whenever circumstances render such a procedure necessary. In order to accomplish this movement, a handle is placed on one side of the foot plate, which is connected to a bell-crank lever, connected by a link to the tappet-rod. This handle is to be secured by a spring guard, and when in a vertical position the tappet-rod will be entirely out of gear; when it inclines forward, it will be in gear for going either forward or backward; and when it inclines backward, the tappet-rod will be lifted on to a stud on the third lever above the centre of the shaft connected with the link on the other side, which will stop the motion of the engine almost immediately, as the steam will be admitted into the cylinder before instead of behind the piston, which will drag the wheels and bring up the engine.

The claim is to 1.—The construction of the slide valve, being a hollow ring through which the steam is either admitted or exhausted, and the means used for keeping the said slide valve steam tight.

2. The combination of the machinery for moving the valve, especially the construction of machinery for moving the said valve so as to work the steam expansively.

3. The construction of the regulator or throttle valve by which steam is admitted to either cylinder only, or to both cylinders at the same time.

4. The construction of machinery for moving the slide valve so as to cause the steam to enter the cylinder before instead of behind, and make it act against the piston.

LIST OF DESIGNS REGISTERED BETWEEN DECEMBER 28TH AND JANUARY 27TH.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
1840.				
Dec. 28	507	J. and J. Walker	Cantoon	1 years
"	508	Shaw and Fisher	Coffee pot	3
29	509	H. Greville	Heat reflector	3
1841.				
Jan. 4	510	Southwell and Co.	Carpet	1
5	511,6	Williams Cooper Boyle and Co.	Stained paper	1
"	517	W. Grounsell	Dressing machine	1
11	518	Henderson and Co.	Carpet	1
"	519	C, H. Ackerley	Asthmatic breast Lamp	3
"	520	S. Hobday	Box for snuffers	3
"	521,8	G. Clarke and Co.	Cantoon	1
13	529	G. Hyde	Envelope	1
14	530	R. F. Grassby	Plough share	3
"	531	T. De La Rue and Co.	Embossed metal	3
15	532	W. Richardson and Sons	Cantoon	1
18	533	Pershouse and Welch	Candlestick	3
19	534,6	W. Evans	Stained paper	1
"	517	Richard Gibson	Envelope	1
"	548	T. Cole	Carpet	1
20	549	J. Yates	Feeder	3
21	550	B. W. Hickling	Brace roller	3
22	551	J. Aston	Button	3
25	552	Pardoe, Hoomans and Co.	Carpet	1
"	553	C. Smith	Color vessel	1
26	554,8	J. Boswell	Stained paper	1
"	559	J. Shillito	Ribbon	1
27	560,1	G. Clarke and Co.	Cantoon	1
"	562	Barber and Colo	Carpet	1

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 28TH DECEMBER, 1840, AND THE 28TH JANUARY, 1841.

John Buchanan, of Glasgow, coach builder, for certain improvements in wheel carriages, whether for common roads or railways. Dec. 28; six months to specify.

William Bridges Adams, of Porchester-terrace, gentleman, for certain improvements in the construction of wheel carriages, and of certain appendages thereto. Dec. 28; six months.

John Wells, of Vale-place, Hammersmith, gentleman, for certain improvements in the manufacture of coke. Dec. 30; six months.

William Henry Kempton, of the City-road, gentleman, for improvements in cylinders to be used for printing calicoes and other fabrics. Dec. 30; six months,

Henry Adcock, of Winstanley, civil engineer, for improvements in the means or apparatus for condensing, concentrating, and evaporating ariform and other fluids. Dec. 30; six months.

William Hensman, of Woburn, machinist, for improvements in ploughs. Dec. 31; six months.

Joseph Parkes, of Birmingham, button manufac-

turer, for improvements in the manufacture of covered buttons. Dec. 31; six months.

William Newton, of Chancery-lane, civil engineer, for certain improvements in the rigging of ships and other navigable vessels. (A communication.) Dec. 31; six months.

Francis Burdett Whitaker, of Royton, Lancaster, cotton spinner, for certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances, which improvements are also applicable to warping and dressing yarns of the same. Dec. 31; six months.

Joseph Stubs, of Warrington, file manufacturer, for certain improvements in the construction of screw wrenches, and spanners for screwing and unscrewing nuts and bolts. (A communication.) Dec. 31; six months.

Thomas Robert Sewell, of Carrington, Nottingham, lace manufacturer, for certain improvements in obtaining carbonic acid from certain mineral substances. Dec. 31; six months.

William Henry Kempton, of Pentonville, gentleman, for improvements in lamps. Dec. 31; six months.

John Grylls, of Portsea, for improvements in machinery used for raising and lowering weights. Dec. 31; six months.

Joseph Haley, of Manchester, engineer, for an improved lifting jack for raising or removing heavy bodies, which is also applicable to the packing or compressing of woods or other substances. Dec. 31; six months.

Louis Holbeck, of Hammersmith, gentleman, for improvements in obtaining or producing oil. (A communication). Dec. 31; six months.

Henry Scott, of Brownlow-street, Bedford-row, surgeon, for improvements in the manufacture of ink or writing fluids. Dec. 31; six months.

Charles Golightly, of Gravel-lane, Southwark, gentleman, for a new apparatus for obtaining motive power. Jan. 4; six months.

George Child, of Lower Thames-street, merchant, for improvements in the manufacture of bricks and tiles, part of which improvements are applicable to compressing peat and other materials. (A communication). Jan. 1, six months.

John Swindells, of Manchester, manufacturing chemist, for certain improvements in the manufacture of artificial stone, cement, stucco, and other similar compositions. Jan. 6; six months.

William Newton, of Chancery-lane, civil engineer, for certain improvements in looms for weaving. (A communication). Jan. 6; six months.

John Rock Day, of Great Queen-street, Lincoln's Inn-fields, saddlers' ironmonger, for certain improvements in the construction of collars for horses and other draft animals. Jan. 6; six months.

Henry Gunter, of Cullum-st., Fenchurch-st., merchant, for improvements in preserving animal and vegetable substances. Jan 6; sixmonths.

Henry Bessemer, of Perceval-street, Clerkenwell, for a new mode of checking the speed of or stopping railroad carriages under certain circumstances. Jan. 6, six months.

William Thompson, of Upper North-place, Gray's Inn-road, brush maker, for improvements in the construction and mounting of various kinds of brushes and brooms. Jan. 8; six months.

William Lacy, of Birmingham, agent for certain combinations of vitrified and metallic substances, applicable to the manufacture of ornaments and the decoration and improvement of articles of domestic utility, and of household furniture, also applicable to church windows and and ship lights. Jan. 11; six months.

Mathew Uzielli, of King William-street, merchant, for improvements in impregnating and preserving wood and timber for various useful purposes. (A communication.) Jan. 11.

William Newton, of Chancery Lane, civil engineer, for improved machinery for cleaning wheat and other grain, or seeds, from smut and other injurious matters. (A communication.) Jan. 11.

Thomas Harris, of Shiffnal, Salop, veterinary surgeon, for an improved horse shoe. Jan. 11; six months.

John Barwise, of Saint Martin's Lane, chronometer maker, and Alexander Bain, of 35, Wigmore-street, Cavendish Square, machinist, for improvements in the application of moving power to clocks and time pieces. Jan. 11; six months.

Joseph Hall, of Cambridge, grocer and draper, for a seed and dust disperser, which is particularly applicable to the freeing of corn and other plants from insects. Jan. 11; six months.

Walter Hancock, of Stratford-le-bow, Essex, engineer, for certain improved means of preventing accidents on Railways. Jan. 14; six months.

Pierre Armande Le Comte de Fontainemoreau, of Skinner Place, Size-lane, for an improved machinery for carding and spinning wools and hairs, which he titles "Filo Finisher." (A communication.) Jan. 14; six months.

Melcher Garner Todd, of the Island of Saint Lucia, for a certain improved form of apparatus for the distillation and rectification of spirits. January 14; six months.

John Loach, of Birmingham, brass founder, for certain improvements in castors, applicable to cabinet furniture and other purposes. Jan. 14; six months.

William King Westley, of Leeds, flax machinist, for certain improvements in carding, combing, straightening, cleaning, and preparing for spinning hemp, flax, and other fibrous substances. Jan. 14; six months.

William Kenworthy, of Blackburn, Lancaster, spinner, and James Bullough, of the same place, overlooker, for certain improvements in machinery or apparatus for weaving. Jan. 14; six months.

Charles Cameron, late Captain in her Majesty's 18th Regiment of Foot, and now residing at Mount Vernon, in Edinburgh, for certain improvements in engines to be actuated by steam or other elastic fluid. Jan. 14; six months.

Samuel Hall, of Basford, civil engineer, for improvements in the combustion of fuel and smoke. Jan. 14; six months.

Alexander Jones, of King-street, engineer, for improvements in the manufacture of copper tubes and vessels. Jan. 14; six months.

Edward Loard, of Queen's Head-lane, Islington, machinist, for an improved method or improved methods of supplying fuel to the fire places or grates of steam-engine boilers, brewer's coppers, and other furnaces, as well also to the fire places employed in domestic purposes, and generally to the supplying of fuel to furnaces or fire places in such a manner as to consume the smoke generally produced in such furnaces or fire places. Jan. 16; six months.

John Armes, of Plymouth, painter, for a new and improved method of making paint from materials not before used for that purpose. Jan. 16; four months.

James Smith, of Deanstone Works, Perth, cotton spinner, for certain improvements in the preparing, spinning, and weaving of cotton, silk, wool, and other fibrous substances, and in measuring and folding woven fabrics, and in the machines and instruments for these purposes. Jan. 19; six months.

Thomas Robinson, of Wilmington-square, esq., for improvements in drying woollen and other fabrics. Jan. 19; six months.

Thomas Vaux, of Frederick-street, Gray's-inn-road, worsted manufacturer, for improvements in horse shoes. Jan. 19; six months.

Caleb Bedells, of Leicester, manufacturer; Christopher Nichols, of York-road, Lambeth, gent.; and Archibald Turner, foreman to the said Caleb Bedells, for improvements in the manufacture of braids and plats. (Partly a communication.) Jan. 19; six months.

John Barber, of Manchester, engraver, for certain improvements in machinery for the purpose of tracing or etching designs or patterns on cylindrical surfaces. Jan. 19; six months.

Frederick Steiner, of Hyndburn-cottage, Lancaster, turkey red dyer, for improvements in looms for

weaving and cutting asunder double piled cloths, and a machine for winding weft to be used therein (A communication). Jan 19, six months.

John Cox, of Gorgie-mills, Edinburgh, tanner, for improvements in apparatus for assisting or enabling persons to swim or float and progress in water. Jan 19; six months.

Charles Berwick Curtis, of Acton, esq., for a method or methods to be used on railways for the purpose of obviating collisions between successive trains. Jan 19; six months.

Angier March Perkins, of Great Coram-street, Middlesex, engineer, for improvements in apparatus for heating by the circulation of hot water, and for the construction of pipes or tubes for such and other purposes. Jan 21, six months.

John Melville, of Upper Harley-street, esq, for improvements in propelling vessels. Jan 21, six months.

William Hill Darker, and William Hill Darker, jun, both of Lambeth, engineers, and William Wood, of Wilton, carpet manufacturer, for certain improvements in looms for weaving. Jan 21, six months.

John Bradford Furnival, of Street Ashton, farmer, for improvements in the construction and application of air vessels. (A communication) Jan 21, six months.

William Cooper, of Lavham, Suffolk, iron founder, for an improved method of constructing thrashing machines and other agricultural instruments. Jan. 21; two months.

Isham Baggs, of Cheltenham, gent, for improvements in printing. Jan 23, six months.

Peter Fairbairn, of Leeds, engineer, and William Sertull, of Newcastle-upon-Tyne, flax spinner, for certain improvements in drawing flax, hemp, wool, silk, and other fibrous substances. Jan 26, six months.

Edward Henshall, Huddersfield, carpet manufacturer, for certain improvements in making, manufacturing, or producing carpets and hearth rugs. Jan 26, four months.

Nathaniel Lloyd, of Manchester, and Henry Rowbotham, of the same place, calico printer, for certain improvements in thickening and preparing colours for printing calicoes and other substances. Jan 26, six months.

Nathan Waddington, Hulme, Lancaster, engineer, for certain improvements in the construction of steam boilers and furnaces for heating the same. Jan 26, six months.

Cornelius Alfred Jaquin, of Huggin Lane, for improvements in the manufacture of covered buttons, and in preparing of metal surfaces for such manufacture, and other purposes. Jan. 26, six months.

John Bradford Furnival, of Street Ashton, Warwick, farmer, for improvements in evaporating fluids, applicable to the manufacture of salt and to other purposes, where evaporation of fluids is required. (A communication.) Jan 26, six months.

Richard Jenkyn, of Hayle, Cornwall, machinist, for certain improvements in valves for hydraulic machines. Jan 26, six months.

William Gill, of Beresford-terrace, Walworth, gent, for certain improvements in the construction of locomotive engines and of the carriages used on railways, applicable in part to carriages used on common roads. (A communication.) Jan 28, six months.

William Currie Harrison, of Newland-street, Pimlico, engineer, for an improved turning table for railway purposes. Jan. 28; six months.

Joseph Pryer, of Wendron, Cornwall, builder, for an improved threshing machine. Jan 28, six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF DECEMBER 1840, TO 22ND JANUARY, 1841.

Robert Cooper, of Pebworth, Gloucester, gentleman for improvements in ploughs. Sealed; December 24, 1840.

Henry Trewhitt, of Newcastle-upon-Tyne, Northumberland, Esq., for certain improvements in the fabrication of china and earthenware, and in the apparatus, or machinery applicable thereto. (A communication.) December 24.

Charles Parker, of Darlington, Durham, flax spinner, for improvements in looms for weaving linen, and other fabrics, to be worked by hand, steam, water, or any other motive power. Dec 24.

John Wertheimer, of West-street, Finsbury Circus, London, printer, for certain improvements in preserving animal and vegetable substances, and liquids. (A communication.) December 24.

Edmund Leach of Rochdale, Lancaster, machine maker, for certain improvements in machinery, or apparatus for carding, doubling, and preparing wool, cotton, silk, flax, and other fibrous substances. December 28.

William Hicklin Burnett, of Wharton-street, Bagnigge Wells Road, Middlesex, gent, for improved machinery for cutting, or working wood. December 28.

John Grylls, of Portsea, for improvement in the machinery used for raising and lowering weights. December 31.

Samuel Brown, of Hoxton, Middlesex, civil engineer, for improvements in making casks and other vessels, of, or from iron. December 31.

William Henry Bailey Webster, of Ipswich, Suffolk, Surgeon in the Royal Navy, for improvements in preparing skins and other animal matters for the purposes of tanning, and the manufacture of gelatine. Dec 31.

Colin Mactae [illegible] Cornhill, Perthshire Scotland, for improvement in rotary engines worked by steam smoke gases or heated air, and in the mode of applying such engines to useful purposes. (A communication.) December 31.

Moses Poole, of Lincoln's Inn, Middlesex, gent, for improvements in dying woollen and other fabrics. December 31.

Thomas Clark of Wolverhampton Stafford iron-founder, for certain improvements in the construction of locks latches, and such like fastenings applicable for securing doors gates windows shutters, and such like purposes. (A communication.) January 6, 1841.

Hugh Unsworth of Blackrod near Bolton Lancaster bleacher for certain improvements in machinery, or apparatus for mangling, drying and finishing woven goods or fabrics. Jan 7.

Henry George Francis Earl of Ducie of Woodchester Park Gloucester, Richard Clyburn [illegible] engineer, and Edwin Budding, engineer of Dursley, in the same county for certain improvements in machinery, for cutting vegetable and other substances. January 8.

Thomas Spencer, of Liverpool Lancaster carver and gilder, and John Wilson of Liverpool aforesaid lecturer on chemistry, for certain improvements in the process or processes of manufacturing metallic cylinders, and for engraving thereon, and for engraving metals generally. January 9.

John Mason of Rochdale, Lancaster, Machinist and Alexander Steven, of Manchester, in the same county engineer, for certain improvements in machinery or apparatus to be used for turning and boring purposes. January 13.

William Hill Darker senior and William Hill Darker junior, both of Lambeth, Surrey, engineers and William Wood of Wilton of Wilts carpet manufacturer, for certain improvements in looms for weaving. January 18.

John Aitchison, of Glasgow, in Scotland, and Archibald Hastie, of West-street, Finsbury-square, Middlesex, for certain improvements in generating and condensing steam, heating, cooling, and evaporating fluids. January 20.

Joseph Haley, of Manchester, Lancaster engineer for an improved lifting jack, for raising or removing heavy bodies, which is also applicable to the packing or compressing of goods and other substances. January 21.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; and W. Campbell and Co., Hamburgh.

Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 913.] SATURDAY, FEBRUARY 6, 1841. [Price 6d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street

CORDES AND LOCKE'S PATENT ROTARY ENGINE.

Fig. 1.

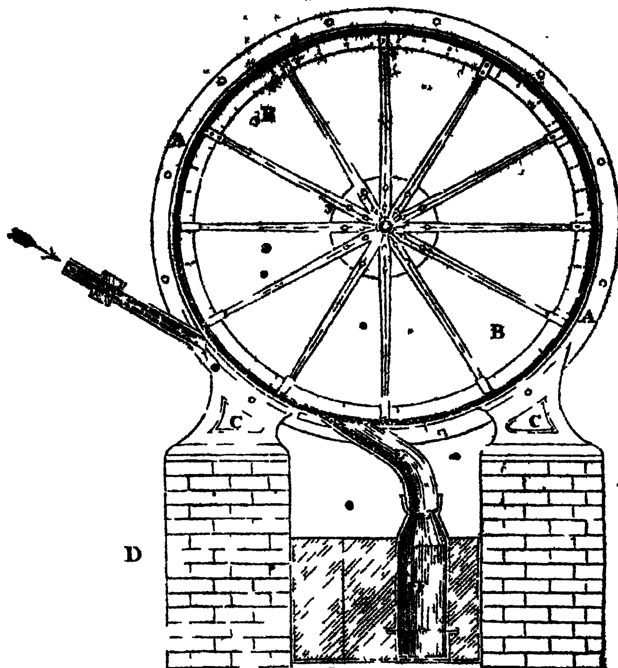
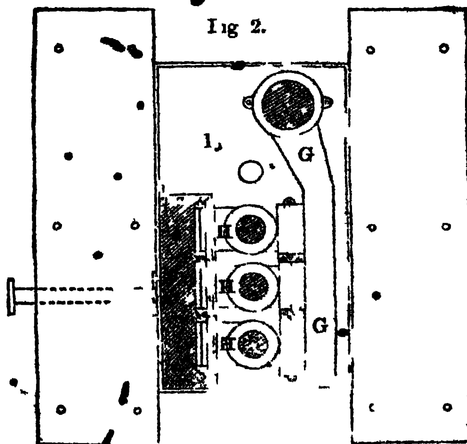


Fig. 2.



CORDES AND LOCKE'S PATENT ROTARY ENGINE.*

The distinguishing peculiarity of this "new rotary engine" is a revolving wheel, something like a breast wheel, enclosed within an exhausted cylindrical box or case, conforming to the circumference thereof, but without touching it, and impelled or turned rapidly round by a constant current of steam entering with force and velocity into the exhausted space wherein the wheel is situated, and impinging against a series of vanes placed around the periphery of the wheel, tangential to its circumference.

The box, or casing, is made of cast iron, in two parts, fastened together by bolts and nuts, and provided with stuffing boxes where the axis of the wheel passes through its centre. The wheel is of iron, mounted on an axle, and has a rim formed by two cylindrical plates, projecting outwards, between which the vanes, which are of copper, are set at a suitable angle. Steam is admitted on one side from a steam pipe furnished with a throttle valve, and, after striking against the vanes, escapes through an opening in the lower part of the casing into an eduction pipe communicating with a condenser placed in a cistern of cold water beneath, so as to exhaust the steam from the box at that part of its circumference where the steam ceases to act against the vanes. In the cold water cistern there are three pumps worked by a three-throw crank, for keeping the condenser constantly exhausted; the condensation water being thrown into a hot water cistern, whence it is fed into the boiler by a force pump worked by a crank on the outer end of the axle. The power exerted by the revolution of this wheel gives motion, by the intervention of toothed gearing, belts, or such other means of communicating motion as may be suitable, to any mill-work or machinery intended to be impelled by the engine. To the other end of the main axle a pinion is fixed, working into and turning a spur wheel keyed on the triple crank shaft which works the air pumps as before noticed. On the same shaft is also fixed a mitre wheel, which, gearing into another, works the governor of the engine controlling the throttle valve in the steam pipe, and thereby regulating the speed of the engine.

An arrangement is described in the specification for keeping the bearings of the main axle cool. A part of the middle of the outer surfaces is turned away so as to leave an opening all round; to each side a small pipe is fitted, the one conveying water from the cold-water cistern, the other returning it into the hot-water cistern; by which means, a constant circulation of cold water takes place around the bearings of the axle, and prevents the temperature thereof from being injuriously raised. The casing of the wheel is supported on standards raised on substantial brick-work containing the water cisterns. The standards are secured in their places by means of long bolts and nuts passing through the brick-work and the foundation plate.

The patentees refrain from expressing any opinion as to the advantages to be derived from this form of engine, inasmuch as they have now nearly completed an engine of considerable power, which will shortly be erected in London and submitted to the inspection of practical men: when that, which would now only be received as the ordinary expression of sanguine expectation, may then be submitted as the demonstration of practical experience.

* James Johnston Cordes and Edward Locke, of Newport.—Enrolment Office, January 18th, 1841.

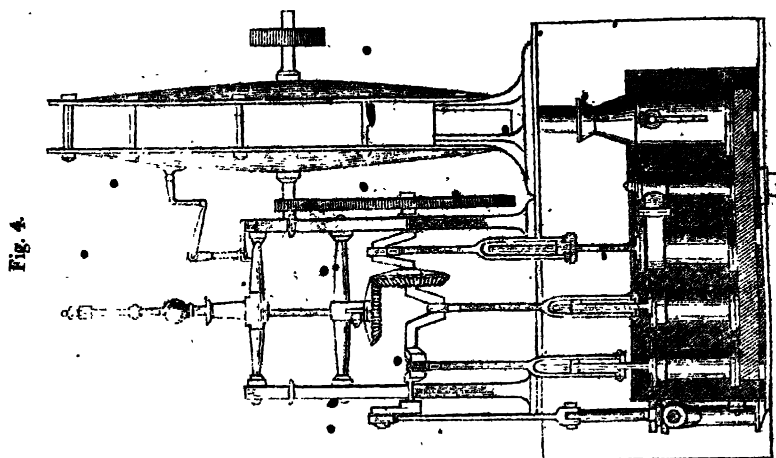


Fig. 4.

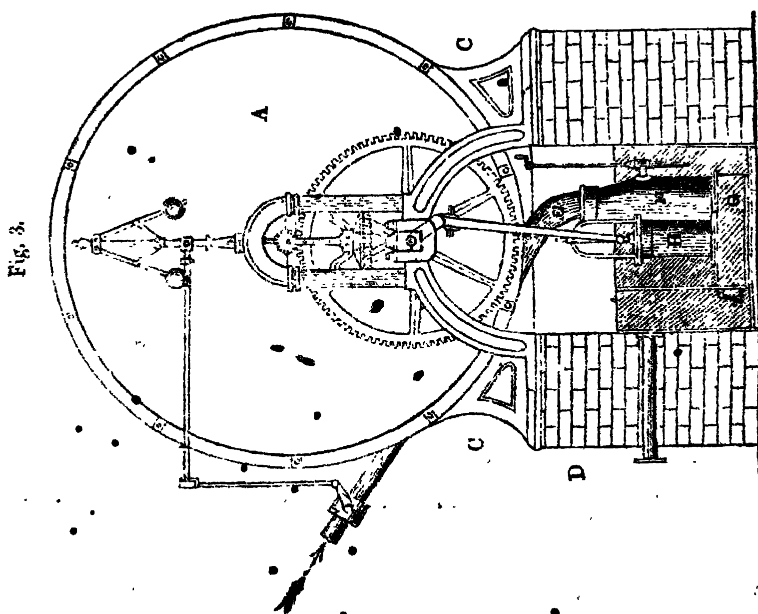


Fig. 3.

Description of the Engravings.

Fig. 1, represents a section of the case A, and steam-pipe, enclosing the revolving wheel B, mounted on standards C, and resting on foundation D. E, is the eduction-pipe; F, the condenser.

Fig. 2, is a plan of the same, showing the position of the foot-pipe G; air-pumps H; cold-water cistern I, and hot-water cistern J.

Figs. 3 and 4, are side and end elevations of the engine.

In a mechanical contrivance so important as the crank unquestionably is, it is highly desirable that everything calculated to mislead the practical man, should be fully, as well as simply, explained; for had the true principles of this simple, yet efficient, mode of transmitting power, been properly understood, many of those vain attempts to supersede its use would have been prevented. That erroneous views on this subject should be entertained by workmen unacquainted with the elements of calculation, cannot be a matter of wonder, but that professors of science should be found telling the public, that "the crank destroys about one-half of the power," cannot be sufficiently deprecated at the present advanced stage of mechanical science. I here allude to a work which has recently emanated from the Dublin National Board of Education.

Mr. Woolhouse, in his edition of Tredgold's work on the steam-engine, has given a very able solution of this problem, founded upon the principles of the differential calculus. Without wishing to supersede that elegant method of investigation, a more simple and popular demonstration is here attempted, depending entirely upon geometrical principles. Anterior to any exact analysis on this question, it might have been inferred, from the principle of virtual velocities, that no force can be gained or lost in any mechanical combination for the transmission of motion, excepting that which may arise from friction.

The great source of error relative to the crank appears to be the confounding of two things in themselves very distinct, viz., *statical* and *dynamical* force, or the effect of a body at rest, and the effect of a body in motion. Now in the crank it is the effect of a dynamical force which we have to consider; where the effective force, turning the crank, at any point, is equal to the product of the pressure, or mass moved, by the velocity.

To render the matter as simple as possible, we shall suppose that the connecting rod V P, moves parallel to itself,—a condition to which an engine approaches when the length of the connecting rod is considerable as compared with the length of the crank; and it is also evident that [illegible] can be shown that no force is de- [illegible] this assumption, the proposition may be taken as equally true as applied to any other. Let F be the force of pressure upon the connecting rod; Pp a very small unit of space passed over by the extremity of the crank, at the horizontal position K O P; then, as the direction of the motion of the point P of the crank coincides with the direction of the motion of the connecting rod, the effective force of the crank in this position $= \text{F} \times \text{P}p$. Let now A O and A′ O be any two consecutive positions of the crank, making A a (the vertical descent of the connecting rod B A)$=\text{P}p$; then A A′ and Pp will be the spaces passed over by the extremity of the crank in the same time; for the connecting rod is here supposed to be equable in its motion. Let A d be taken equal to F, and from d draw $d\,n$ perpendicular to a tangent drawn to the point A; then, by the resolution of forces, A n will be the effective pressure, $n\,d$ being the strain upon the pivot of the crank,—hence :

The dynamical or effective force at $\text{A} = n\text{A} \times \text{AA}'$ (1). When A A′ is taken very small (and we may take it as small as we please, for we only want the *ratio* of the velocities of the points P and A) it may be regarded as a right line; then, because B A and B A′ are parallel, the angles $d\,\text{A}\,n$ and $a\,\text{A}\,\text{A}'$ are equal, and the triangles $d\,\text{A}\,n$ and $a\,\text{A}\,\text{A}'$ are equiangular, hence :

$$n\text{A} : d\text{A} \text{ or F} :: a\text{A}' : \text{AA}' = \frac{\text{F} \times a\text{A}'}{n\text{A}}.$$

∴ by substitution in equation (1) the dynamical force at $\text{A} = n\text{A} \times \dfrac{\text{F} \times a\text{A}'}{n\text{A}}$

$= \text{F} . a\text{A}'$, or F. D p.

But it has been shown that the effective force at $P = F \times Dp$ ∴ the effective force at A = the effective force at P; and the same may be shown for any other point in the revolution.

It appears, from the above investigation, that the reduced pressure at any point, expressed by the fraction $\frac{A\,n}{A\,d}$, is exactly compensated by the increase of motion, expressed by the ratio $\frac{A\,A'}{A,\,a}$. For example, let the $\angle$ A C K = 30°, then $\angle$ n A d and A A' a are each = 30°, and consequently, the reduced pressure = ½ d A or ½ the force of pressure at P; but A A' = 2 × a A, or 2 × P p; that is to say, whilst there is only one-half of the force of pressure exerted at A that there is acting at P, yet the crank at A moves with twice the speed that it does at P. If P p or a A, the vertical descent of the connecting rod be .1 inch, then the arc over which A would move = .2 inches. Since it appears, from what has been said, that a uniformity in the motion of the piston, is accompanied with an irregularity in the motion of the crank: and that, *vice versa*, an equable motion in the crank, would induce a variable motion in the ascent and descent of the piston, it follows, that a perfectly uniform motion cannot be attained by this, otherwise perfect, method of converting a reciprocating into a rotary motion.

I am, Sir,

Yours, &c.,

THOMAS TATE,

Late Lecturer on Chemistry in the York School of Medicine.

THE "NEW THEORY OF THE UNIVERSE"—(VOL. XXXII, P. 555.)

Sir,—A close investigation of the "New Theory of the Universe," would conduct us to the Mysteries of Divinity, or to the hated path of Materialism: controversy unfit for a mechanic, and entirely useless to the perfection of his work. This remark is necessary, to avoid any misrepresentation of my object in prosecuting inquiries in a work which is devoted only to the progress of science and its useful application to the welfare of society.

I will admit a firmamental fluid (see page 37) filling up the Universe without a limit, in a state of positive cold; but is the power of absorption inherent to the matter or due to a peculiar disposition of it?—Are vitality and vegetation the cause or effect of such a power? At all events, it must be incessant to produce gravity; and if any contrary motion is the consequence of the reaction of the various fluids constituting the state of positive heat, how could we at once account for so many different movements assumed by the heavenly bodies? The sun *rotates* or revolves on its axis in the centre of a system;—the earth revolves on its axis and round the sun;—the moon goes round the earth, but respectively to the earth does not revolve on its axis;—the meteoric substance of the comets, in their eccentric travelling, has no rotary motion on itself, as may be presumed by their configuration, &c.

Now I should wish to inquire if the electric and magnetic fluids are among the *traversing* fluids within the atmosphere?—And if it is presumable we could render the firmamental fluid actually manifest to our senses in its state of positive cold by some kind of instruments, as we do electricity?

I present these questions to "E.A.M." not as an opponent, but as a well wisher.

R. C.

January 25, 1841.

MR. PEARCE'S PLAN FOR REVERSING THE ACTION OF STEAM ENGINES—ANTICIPATED BY MESSRS. CARMICHAEL, OF DUNDEE.

Sir,—In Number 906, p. 573, of your valuable Magazine, Mr. Pearce of Leeds gives a description of a plan for reversing the slide valves of a locomotive engine, with one fixed eccentric block, &c.

This design is by no means new, as it was appended to the engines of a small steamer that plyed on the river Tay about twenty-four years ago, by Messrs. J. and C. Carmichael, engineers, Dundee, and subsequently to the engines of the Tay ferry boats (one of which is still on the passage), a description and drawing of which will be found in Vol. IV., p. 305, of the *Mechanics' Magazine*. The apparatus there described is applied to concentric valves, but is quite as applicable to reverse the common slide. It would be superfluous to give any farther explanation than what is recorded there. I would simply add, as a proof of the

utility of this invention, that the parties referred to, have uniformly adopted the same principle, namely, *of one fixed eccentric block and double spanner upon the end of the rocking shaft*, and applied it to all the engines they have constructed, when the motion required to be reversed. The same contrivance is now almost generally applied to the locomotive engines working on the railways in this quarter.

I am, Sir,
Your most obedient servant,
A CONSTANT READER.

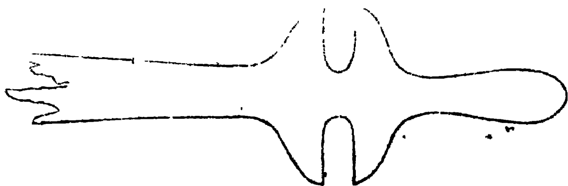
Dundee, Jan. 30, 1841.

MR. PEARCE'S DOUBLE ACTION PLAN.

Sir,—Without the remotest disposition to detraction, and with the view merely of pointing out a corresponding application of one fixed eccentric to the attainment of a forward and backward motion in the same engine, I beg to refer to the account of Mr. John Charles Pearce, in Number 906 of your valuable Journal, wherein the practicability of such application is pointed out, so as to supersede the use of two of the four eccentrics employed in locomotive engines; by which means the first cost, friction, and consequent wear and tear, may, in some measure, be reduced in those engines.

The example of the fixed eccentric for reversing, &c., to which I allude, I remember to have seen some years since on board a steam vessel fitted with two engines of ten-horse power each, worked by four-way-cocks on a peculiar construction, patented, I believe, by Mr. Henry Maudslay.

The lever affixed to the axis of the "steam cone," as it was termed, was formed with two arms as suggested by Mr. Pearce, one of which was prolonged beyond its joint pin so as to enable the engineer to reverse by hand; in such case the eccentric, whose end was formed thus,



could be engaged so as to allow the engines to work in gear.

The forked eccentric in the locomotive engine, I need not remark, is calculated to supersede such provision in the valve lever; the inclined planes forcing the slide into the required position.

It is more than probable that Mr. Pearce has never encountered such arrangement before, as the engines alluded to are the only ones of the kind I have ever seen; at all events, the suggestion with respect to locomotives, as far as I am informed, belongs to him alone.

One of the contingencies attending the use of the single eccentric in locomotives will be, that the *throws* of the eccentric must be increased in proportion to the increased length of the levers attached to the eccentric rods, when the slides have more than ordinary "lead."

I am, Sir, your most obedient servant,
NAUTICUS.

Woolwich, February 2, 1841.

P. S.—(Sulphate of Copper.)—In my communication on the subject of the "Preservative Property of the Sulphate of Copper," in No. 906, p. 568, 2nd column, line 9, for "lively" read "levels."

And with reference to the editorial note on the subject in your last number, I beg to observe, that this solution has not been practically employed in the mining districts, for such objects, to my knowledge; the observed circumstance of timber in remote recesses of the mines being in a good state of preservation—although in all respects situated so as to favour the production of fungus under ordinary circumstances—is that for which I take credit. N.

PEARCE'S CONCENTRIC VALVE FOR LOCOMOTIVE ENGINES.

Sir,—On perusing your journal for December, I observe a letter by Dr. Bagot, respecting the concentric valve I communicated to you about three months since. Dr. B. in his communication states that the valve in question is but a modification of, and liable to the same objections as, one invented by a Mr. Murray. Now it would have been much more satisfactory, in my opinion, had the Doctor just mentioned a few particulars respecting the valve he alludes to. As he has not done so, I feel rather doubtful on the point of actual identity.

At all events, I was not aware that a concentric valve of this kind had ever been in use, the idea was quite original to me, and I communicated it to you merely as a suggestion. For my own part, I see no objection to it in any case where the common straight valve (such as those used for locomotives) is adopted. In consequence of its form, instead of planing as the common slide, it will require the operations of boring and turning, a matter of small consequence to those who are in the habit of making such things.

I remain, Sir, yours respectfully,

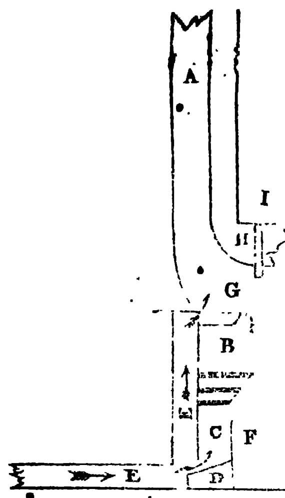
JOHN C. PEARCE.

Leeds, Jan. 20, 1841.

JONES' METHOD OF SETTING STOVES, AND IMPROVED FIRE PLACES.

Sir,—The late severe weather having led me to reflect upon the means of increasing domestic comfort, I trust the following observations, and as I conceive improvements in the mode of setting stoves, so as to procure an increased artificial heat, will not be altogether thrown away.

In all stoves which have hitherto been in use there appears an objection, which is, the great quantity of rarified air that passes up the chimney—thereby causing a partial vacuum, or want of air, the supply being kept up by the fresh air rushing in at every door or aperture. The improvement I beg to suggest will be understood from the enclosed diagram, representing the section of a common fire-place. A is the chimney, B the fire-grate, C, the ash-pit, D the drawer to catch the ashes, E E air passages communicating with the open air; F is an iron plate closing up the ash-pit, excepting a small aperture round the upper edge, which allows the air to pass to the front of the fire; G is a hollow plate projecting from the back of the fire-place, which plate is



perforated on its upper surface. Communicating with the air-pipe E H is an iron plate which can be raised or lowered, and by means of which the draught can be increased or decreased at pleasure; I is the mantel-piece. The bars of the grate are represented as increasing in projection at the top, thereby allowing the air to come in contact with the whole face of the fire. The projecting plate G prevents the flame from ascending too high up the chimney, which causes a much greater heat to be given out. The plate above described being hollow and perforated with small holes on its upper surface, the air rushes up the pipe E, through the apertures, and up the chimney, causing a current of air which draws up the smoke. There are many ways of supplying the air from the street, such as having an aperture about an inch wide directly under the window-sill, or a circular opening surrounded by a cast-iron wreath, &c.

I remain, Sir,

Yours, &c.

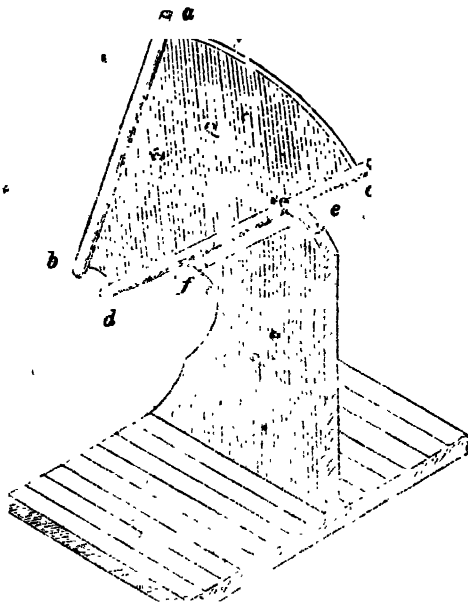
J. JONES.

Hart-street, London.

SIMPLE INSTRUMENT FOR FINDING A MERIDIAN LINE.

Sir,—During a recent visit to London I have been contriving a new kind of instrument for finding a meridian line, for the making and fixing of sun-dials. But as I have neither time nor tools here for

making a perfect instrument, I will describe it so that any other person may do so if they think it will be worth their while. The rough model sent herewith (represented in the accompanying engraving) may be sufficient to give an idea how



the instrument is to be made and used. Two tubes *a b*, *c d*, are to be fixed fast on the moveable part Q, so that one of them shall point to the pole star, Alrucabbah, while the other points to the fixed star, Capella. The line between the two joints or rings *e f*, on which the moveable part turns, is to make an angle with the horizontal board S, at the bottom, equal to the latitude of the place, and then (when the instrument is set right) this line will be parallel to the axis of the earth, and the pole star tube will be nearly parallel to it, being only about a degree and half from it. The other tube, pointing to Capella, makes an angle of about 45 degrees from that pointing to the pole star. Then, by setting the instrument on a level plane, and turning it about until the two stars can be seen through the two tubes, the edges of the square horizontal board at the bottom will point exactly to the east, west, north, and south. No matter what o'clock it is when the observation is taken, nor what day of the month it is, nor what time of the year; *any time* will do when the two stars are visible. And when it stands upon the level plane the two stars cannot be seen through the two tubes, but only when it is set right in the meridian. The parallel lines on the bottom board being meridians, any of them can easily be marked upon the level plane on which it stands. And this two-tubed instrument may be used with equal accuracy in a different way, for when the two tubes point to the two stars mentioned, the bottom board will be raised either on the north or south side, according to the difference of latitude, without the observer being at the trouble of making any alteration or preparation for the difference of latitude. Any other two fixed stars would do for this purpose if they were at a considerable angle from each other, but many of them are not visible every night in the year. Perhaps the star Vega instead of Capella, would suit better for this purpose, as it is nearer to the equator, and nearer in the plane with the Pole Star and the Pole, and it is visible some part of every night in the year when the sky is clear. But Capella and

the Pole Star never set in England, therefore they are visible all night, and every night in the year when the sky is clear,

I remain, Sir,
Your obedient servant,
W. W.

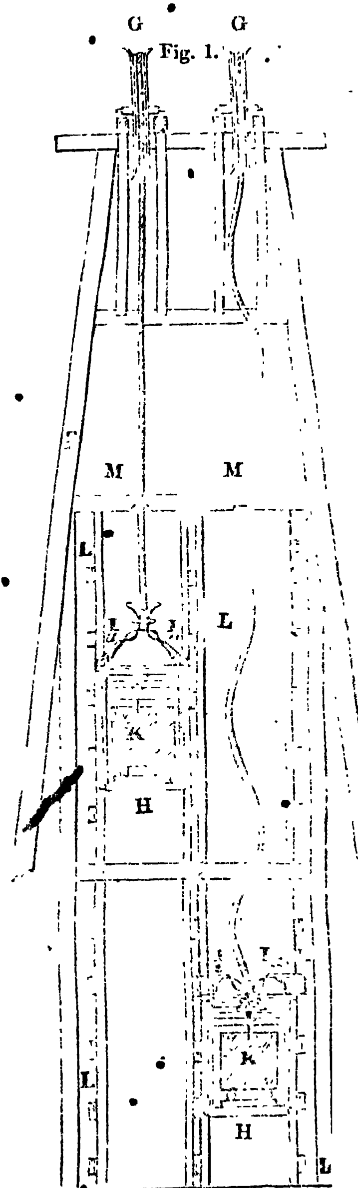
January 15, 1841.

SAFETY LEVER AND SAFETY HOOK FOR THE PREVENTION OF ACCIDENTS IN ASCENDING AND DESCENDING COLLIERY PITS, &c.

Sir,—My attention has been drawn to the following subject for some time past by the melancholy sacrifice of human life and property that is continually occurring in the mining districts, the more especially upon the coal fields in the North of England; and I experienced very great satisfaction in being able to lay before the coal trade and the public, at the late Polytechnic Exhibition at Newcastle-upon-Tyne, an invention that will place a very meritorious, and adventurous class of our fellow-subjects in comparative safety during their hitherto exceedingly dangerous ingress and egress to and from their work.* And also prevent the great destruction of property that must necessarily follow the breaking away of a cage, or the same being drawn over the pulley by casualty or inadvertance. And I have been led to lay the same before your readers, from having seen in one of your numbers, a plan suggested by Admiral Bullen, of Bath, in which the worthy admiral aims at the same object.

I will not attempt to draw any comparison between the two plans, as it is quite obvious that the admiral's views are precisely the same as my own, i. e., the benefit of the mining community without any desire of pecuniary profit. It would be superfluous to say more in explanation of the plan I suggest, as the practical man will see at once, by referring to the annexed diagram, the efficiency of the means proposed, but I may state that my own confidence in it is such, that I have adopted it at the Evenwood Colliery, Durham, where it can be seen at work, and its capabilities fully tested.

And I have that faith in the good feeling that exists on the part of the coal owners towards the men under them,



and the great anxiety they feel for their protection and security while engaged

* From a paragraph in the *Times* we see that last week as six young men were going down a coal pit in the neighbourhood of Llangollen to their work, the chain broke, precipitating them to the bottom; the shaft being about 80 yards deep, they were all killed on the spot. Ed. M. M.

at their work to anticipate its general adoption where the cage is made use of.

I am, Sir, yours obediently,

JNO. A. FOSTER.

Bishop Auckland, Durham, January 9, 1841.

Description.

Fig. 2.

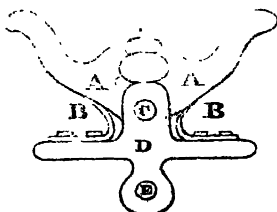


Fig. 3.

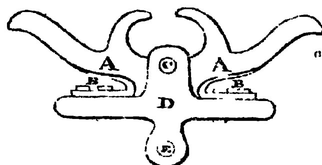


Fig. 1, is a plan of the *Safety Lever* and *Safety Hook* in operation. F F are the sheer legs; G G the pulley-frame sheaves and ropes; H H the cages with the safety levers attached at I I I I; K tubs; L L the buntons; M M two holes in a strong cross-piece, N, through which the ropes pass freely. The lower part round the hole is shod with strong iron plate.

Figs. 2 and 3, the Safety Hook. A A, are two pieces fitting past each other at the points (as shown) when shut and held in that position by two powerful springs, B B; C in each is the axle or centre which connects A A with the lower frame D; E the loop or hole where the cage is attached, as shown in fig. 1. Fig. 3, shows the action in letting the rope and loop *slip* in case of coming in contact with the cross-piece N in fig. 1.

Mode of Action.—Suppose the cage on the *right side* to be in motion (either up or down) and by any accident the rope has broken (as shown on the *left side*) the safety levers (moving on an axle at *a a*) will fall down by the weight of the chain and hook, and the extreme ends of the levers (which before moved freely and clear of the buntons, will catch the buntons and be held firmly there, until drawn up again from the top. Thus the fall can never be more than *three feet*, or upon the average *eighteen inches.* O, some grating, or sheet iron to protect the heads of any persons who might be in the cage at the time of accident, from the falling chain. *Safety Hook.*—Should the engineman by *neglect* or *accident* cause the cage to be drawn higher than is safe, the arms A A will come in contact with the cross-piece N, which will cause them to let slip the rope and loop, and the cage can only fall *three feet.*

CONDENSATION—MR. HOWARD IN EXPLANATION.

Sir,—Allow me to point out an error in my communication in your last Number, as it renders a sentence unintelligible. In the paragraph "the water from the hot cistern may obviously be made to flow on the outside of the pipes or other surface and the cold water within the boiler," for "the boiler," read "the latter;" that is to say, the cold water may be passed through the water in the hot cistern or coming from it. By this arrangement no cold water cistern is required when the hot cistern is large enough (which is very generally the case in steam vessels) to contain the tubes necessary to present a sufficient surface, under a very compact disposition of them, which I will explain when I furnish you with a general description of my process of condensation.

While again on this subject it occurs to me, that as I have taken upon myself the task (not a very gracious one as appears by the manner in which it has been replied to) of correcting the overdrawn statements of others as to the saving of fuel, that I ought to say what I myself take it to be. It is thus—and when the process is *effectually* applied: *One sixth*, under ordinary circumstances, and which will probably be increased to *a fifth* in very long voyages; and there are conditions under which *this* estimate will require some allowance. Further, it is not stating too much to presume that the boilers will last nearly twice as long as with the usual plan of injection and consequent deposit of salts, mud, or other impurities.

I am, Sir, our most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe, Feb. 2, 1841.

GALLERIES OF PRACTICAL SCIENCE—A VISIT TO THE "VICTORIA," MANCHESTER.

Sir,—Permit me, Mr. Editor, for a brief period to occupy your time whilst I offer a few remarks on a subject, comparatively a novel one to the public at large, but one, notwithstanding, of some interest—namely, the character and objects of those modern institutions denominated "Galleries of Practical Science."

The announcement of such an institution having been established in Manchester, the town where I reside—the very metropolis of science in practice—and the publication in the journals of some of the lectures delivered at its evening meetings—have led my attention to the subject, and induced me to visit the "Victoria," in the hope and expectation of finding an institution equal to its elevated pretensions, and in every respect worthy of the immense and important district in which its locality has been fixed.

The estimate of the value and efficiency of this institution (as now ordered and arranged) formed by one who has spent a long and busy life in the actual practice of much it professes, will perhaps be best conveyed by a general, but brief description of what is actually offered by it to interest and instruct us. Before, however, proceeding to such description, I will first take a general view of the position an institution like the one in question holds amongst others of kindred, but not identical character, which are now scattered throughout our country for the propagation, amongst its active and intelligent people, of the treasures of literary and scientific knowledge.

The primary object of such an institution is that of disseminating sound scientific knowledge in a manner, and to an extent best calculated to stimulate and foster invention and discovery. Its sphere of operations is by no means a restricted one; but that sphere will, by the mere force of circumstances external to the institution itself, be found to embrace chiefly, and almost exclusively, the more wealthy and enterprising of our artizans, merchants and manufacturers. It will be that class of persons who have both the means and the leisure to seek and labour for that knowledge which they possess not, who enter on the pursuit either from a love of information abstractly, or, stimulated by enterprise, from the *power* it confers—that will resort to the opportunities and advantages such an institution may present. It will not be the mere labourer whose time and anxiety are occupied in providing for his very existence, who will resort hither to study the principles of science and apply them to his art; and as little, on the other hand, will it be the man of perfect independence and irresponsibility;—for, except in some rare instances—invariably the result of accidental bent in early youth—such men, exempt by circumstances, will never, by mere choice, encounter the severe labour and mental discipline which a successful study of science peremptorily demands. It is the class between these two; the most important in number, in usefulness and influence; and in point of individual pursuit and intellectual acquirements, the most varied, who will call for the exertions and reap the benefits of such institutions.

The mode of procedure by which the objects of such an institution must be attained will be—*firstly*, by an exhibition of the fundamental principles of science; in which so judicious a selection is made of its more abstruse and its simpler doctrines—of its theories and experimental facts—as shall be adapted to the diversified character of the auditory to which such instructions are likely, from time to time, to be addressed. And, *secondly*, by an ample and diversified exhibition of the instances in which these elementary principles have been used and applied to the purposes of art, science and manufacture—such an exhibition comprehending, of course, extensive philosophical apparatus and models of interesting inventions.

A clear exposition of any law of mechanical philosophy should be followed by the exhibition of some machine, in the principles of the construction of which, that law has been recognised; and from which, conversely, by an analysis of its principles, that law can be again deduced; a demonstration which should next be followed by the exhibition (wherever practicable) of the uses and products of the same machine; a course of instruction by which evidence of the

most indisputable and stimulating character would be afforded of the real nature of true science and of its incalculable advantages and results.

In another, but not less important field of instruction, presenting subjects of exquisite beauty and endless variety, the laws of optical science should, for one instance, be exemplified, in their application, by the construction of the telescope; and in their results to the benefit of mankind, by the magnificent and stupendous achievements of astronomy.

And in like manner, an exposition of some principle of chemical science should be followed by an exhibition of some instance of its application to art or manufacture; of which examples, that of the chemical influence of the Solar Light upon the substances used in the modern art of Daguerreotype, might be selected as one out of an incalculable multitude, equally elegant and instructive.

An institution organised on these principles, and so devoted and of easy access, and in which the procedure just indicated should be extended to every other branch of scientific knowledge, would unquestionably prove of incalculable value to the people of Manchester; and is one which their immense population and resources should surely enable them to command.

A little reflection upon the nature of such an institution, will serve to show one point, which might not, perhaps at first view, be very apparent—that it is in no respect *school-like*, and that, consequently, it neither partakes of the character, nor interferes with the objects, of those two great, but widely-separated schools—the Universities and the Mechanics' Institutions.

In both these, although so different in particular character and pursuit—the general object is the same—merely elementary instruction—in which the *tools* only are obtained possession of for the future *work*. Classes for drawing, for the languages, the mathematics, geography, &c., are not to be looked for in galleries of practical science, to which the student comes fore-armed and prepared with such acquirements to enter on a more advanced stage of manual and intellectual exertion.

With such a conception of the intentions and capabilities of institutions of this kind, I proceeded one day, a little while past, to the Victoria Gallery of this town; not anticipating, on the one extreme, to find Mr. Day exhibiting the "Fire Cloud" to a multitude of the wondering unwashed; nor on the other, to hear delivered a well-digested and elegant prelection to some men of Trinity from the present accomplished Dean of Ely; but rather did I expect to meet with a substantial, efficient, and appropriate exhibition of valuable art and true science—bearing the obvious impress of the reputed character of its originators and of their common sense—the men of Manchester. We shall see!

The Gallery.

My shilling paid, I entered; and behold! first, a youthful widow fixed in keen and independent gaze (I could scarce divine whether of approval or reproof) on my entrance. Nigh to her, in close juxta-position, but in most unfortunate association, hung a bouquet of dingy and faded flowers. I was not, however, held long in wonder or admiration: a concave mirror had the honour of creating this wondrous mystery; in which it was hard which most to admire—the awkwardness of the adjustment as a mere optical experiment, or the extreme puerility and frivolousness of the conception itself. I turned me now to take a general survey of the capacious apartment and its appurtenances; and the senses are, for the moment, bewildered and undetermined whether to pass their evidence to the mind in favour of a "beggarly account of empty boxes," or of a multitude of heterogenous and frivolous nothings! A few mimic bridges and viaducts, plaster of Paris busts, and glittering brass rods, hung with little pictures, occupy and fill up the field of the retina, producing no better or more distinct impression on the mind than that, by some inexplicable mistake, you have walked into an overgrown and preposterous baby-shop! But, *seriatim!* In the locality of the "widow," to the right and left, we have an abstract of an optician's shop—but, an abstract only. That at Charing-cross, of Messrs. Watkins and Hill, compared in the amplitude and variety of objects to be seen in *it*, with this restricted and shrivelled selection of the Gallery of Science, is involuntarily suggestive of an analogous difference which *we* are just beginning to perceive—that between the Mersey and the Irwell—between the mast-forest of the one, and the one or two solitary barge-poles of the other! A few of the specious and glittering kinds of apparatus of the mere electrician—electrical jars—electrical balls—electrical guns, with

wooden men to fire them—glass rods, variegated with tin-foil, wherewith to spell your name, or some mystic word by the flame of mimick lightning—one or two magnets, electrical machines, galvanic troughs and piles, a few specimens of Daguerreotype, a sextant, a quadrant, an hydrostatic balance, and a few other such common and every-day odds and ends, make up the sum of this, the first, and evidently the most impressive—intended portion of the Gallery; and for the which you *pay* when *passive* to *look* at, and when *active* to *laugh* at! Leaving these, you proceed inwards; and passing by some specimens of the ingenuity and enterprise of Messrs. Sharp and Roberts, you go on wondering what Mr. Yates's porcelain letters, or the one or two magic lanterns, have to do with "practical science;" not, however, altogether without some lingering surmise that perchance the latter may have participated in the progress of civilization; and that the days (to me, the long past but joyous ones) of the knife grinders, and the apple women with wheel barrows, and the boys riding upon pig's backs, may have been superseded by an era of a loftier order, in which a shade of philosophy and the adept may actually have usurped the place of fun and the showman, and their present local place of habitation is in favour of the hope. Passing all these and much more, you come chock up to a reservoir of water, a glance over which and its concomitant wonders makes you instantly to think of Lilliput—of its people and their doings—and intensely to lament that their pigmy existence was, alas, no reality, but a mere figment of the brain. I came at a lucky moment. A mimic steamer the size of an opera hat, per force of a most vivacious effort of its tiny paddles, was braving the perils of this mimic ocean; but with a praiseworthy regard for its inexperience and impotency, the infant vessel was still in leading-strings—a cord tacked to a dolphin's tail kept it within certain bounds and beyond certain dangers. An handful of ignited charcoal, placed among its entrails, did the mighty deed; to the great delight of a man wearing on his dress huge and significant brass buttons, and to another man without buttons, apparently the two conservators of order and decorum throughout this wondrous region. To the right, in an arm of this same ocean, floated another steamer, in which the functions of a boiler and engine seemed to have been supplied by some internal spring, upon the touching of which a revolution or two of its paddles took place, and its power was expended! A model or two of canal water locks—of water wheels—a "fall" and an "undershot," the construction and dimensions of which lead one to think of some flour mill in which the tiniest of tom tits is the miller—an hydraulic ram—gold fish and bird cage—a rotary pump—and the catalogue of *this* department of practical science is ended!

But to be grave. What possible good can result from such contemptible and paltry display? Every one knows that a piece of wood, shaped like a vessel, will float in water, and that a thousand awkward contrivances may be used to move it; but to offer such, even to boys of the last form, as an exhibition of practical science, is a conception beneath all contempt. Had the models referred to shown the most approved modern build of the steamer, and the most effective construction of its machinery, the design would have been interesting and instructive, and the examination of them would have ended in gratification, instead of producing a feeling of shamefacedness, that, as a man, you found yourself in a toy shop, the best trifle of which you would scarcely condescend to bring within the reach of your youngest child.

But to proceed. You pass by some glaring Chinese pictures; a bust of Napoleon, presiding over a case showing the progressive stages of gun making, (contributed by Mr. Edge, and of which kind of illustration were there more it would be well); then a marble table and a looking glass, and you arrive at some articles of vertu—bronze castings, illustrative of some mythology and of the Iliad. It would afford some relief, amidst the miserable dearth that prevails, to dwell upon these, to recall to the mind's eye the almost faded visions of the "blind old man's" immortalities. *These* have been contributed by Mr. Peel. But, again—What has "practical science" to do with a miniature chariot "to be sold," which you next encounter?—or with the tableful of alabaster vases and pitchers, of the most ordinary kind?—or with the assortment of crockery ware and toilet bottles next to it, of so shabby an aspect that I would venture to affirm the commonest pot shop in Deansgate could furnish a thousand superior to it?

Among such objects and such reflections, you reach the limits of your perambulation, the extreme end of the gallery, in the furthest corner of which stands a little printing press, from which a solitary operative is working off little red and blue labels, and ever and anon casting furtive and anxious glances towards the dial plate of the musical clock, to discover how far off the time is when he shall escape from the task of exercising the functions of a living advertisement. A "pyramid" (?) of cog wheels—some patented machinery—relieved from the charge of absolute unattractiveness, solely and exclusively by the admirable lathe of

Mr. Whitworth—closes the catalogue of everything that conspicuously meets your view or claims your attention in the Manchester Gallery of Practical Science!

In the midst of my surveying I had been called off, along with *three* other visitors, to witness the exploits of an electro-magnet, which occupied about five or ten minutes; and I was now again summoned by our old friend of the brass buttons to the lecture room, where the "phantasmagoria was going to be shown," and whither I went accordingly. The joint partakers of the anticipated intellectual treat were now swelled in number to *six* persons—three men, a grown woman, and two children. Down went the green curtain, and after a brief period of preparation and a peroration regarding the high scientific attributes of magic lanterns, our feast began. On the white disk appeared a rose in full bloom!—"a beautiful natural object, and well delineated by the artist." A few moments' revelry of delight to us, and behold, in the twinkling of an eye, a little Cupid, with his bow and arrow, in the middle of the rose! After this—the beautiful and the love-like—we were presented with a specimen of the terrific: The head and mane of an immense lion appeared, which, after a moment of quiescence, gave evidence of life in the rolling of his eyes and expansion of his jaws, to the great wonder, doubtless, of the little boy and little girl present! To the lion succeeded Mahommed Ali, who in like manner rolled his eyes, and looked to all intents and purposes as though he could, and *had* in his time, slain more Turks than he could eat! Then came a ship sailing round the world, some comets' tails, a few pretty views of landscapes, &c., and the feast was over! How I longed to be a child again, to *feel* it all—to live for ever among all these joyous things—to play in the mornings with the little steamers, and in the evenings to ride in the miniature coach, to see the magic lantern, and all this with the happy confidence of protection the while, of its innocence and its propriety, for over this nursery elysium the presiding genius is a solid gray-haired man of seventy. Of not much higher order is the blowing up of the *Royal George*, the description of the electrotype, or the experiments with the electric machine, which, with those already enumerated, make up the whole syllabus of the present daily routine of verbal and experimental instructions of this Gallery of Science!

Instead of encountering the mass of genteel and highly gratified people who for ever crowd the Adelaide and the Polytechnic, of London, you meet in the Victoria, of Manchester, with scarcely a solitary individual; the place is almost wholly and continually empty. The same servants who perform the menial work of fire-lighting and window-cleaning attend upon the visitors here, whereas in London, and everywhere else within my acquaintance, an individual fully qualified and expert in his own department is appointed to such office of attendant; and the enthusiasm and evident intelligence of these men are peculiarly infectious and attractive. After visiting the Victoria you are peculiarly impressed with the fact of the extreme paucity of subjects to which the verbal instructions and the illustrative experiments are devoted—of the few that have been selected out of the multitude of existing and inviting scientific subjects—and by the singular circumstance of the unmerited preeminence which, even in this slender selection, is given to one scientific branch alone—namely, to electricity. Equally are you struck with the preposterous folly of an arrangement which imposes upon *one* individual the mental and manual labour of preparing and conducting the whole routine of business—of superintending, unaided, an establishment embracing within its sphere of operations every branch of scientific knowledge and practice. Equally judicious and reasonable would be a scheme which should attempt to command the whole mineral wealth, and provide the whole motive power of Lancashire by the unaided efforts (devoted to each in succession) of one solitary horse; to which, even amidst this labour, should be allowed but a scanty period for rest, and but a scurvy allowance of corn!

The Gallery in its present state, and considered with respect to its collected contents, is indeed *not* a Gallery of Practical Science, but rather a caricature of such, or a place wherein tradesmen deposit goods to be seen and sold. If we except the solitary instance of the true-surface plates of Mr. Whitworth, not one novelty is there in it; nor is there one thing interesting that may not as well, and with even greater facility, be seen daily and at any time in our own shops, and that, too, without the accompanying detraction of a fee.

A glance over the list, hung near the door, of the highly respectable names of

the proprietors, leads me in the end to one of two conclusions—either that there exists amongst them a most singular misconception of what the true aim of such an institution should be, and what the most effective mode of securing to it an ample success; or that its present pitiful condition is but a necessitous apology for that which a more extended patronage, and the possession of more ample funds, will enable it to reach. And with a fervent hope that, for the credit of Manchester, the latter may be the correct inference; and that the wishes and ultimate designs of its originators may before long meet with a most successful accomplishment.

I beg, Sir, to subscribe myself
Your most obedient,
ADAMANTOS.

Manchester, Jan. 27, 1841.

SOFTENING ANIMAL MEMBRANES—SIMPLE PENHOLDER.

Sir,—For the information of "Coriarius," I beg to state that my skins are covered with valuable hair and fur, and which I wish to preserve uninjured.

Much having been written on the subject of pen-holders, I find nothing so simple, easy, and useful, as a common quill, cutting off as much as to admit the steel pen, which can be firmly secured by a small piece of cork, without the intervention of a slider, or any other apparatus, a quill having been selected which suits the hand, as to thickness and bend. In using a small, sharp-pointed steel-pen, if the quill only is placed and held the under side uppermost, or the reverse of the usual way, the point of the pen is thrown more upwards, or farther from the person writing, and has, consequently, not that tendency to catch in the paper so much complained of.

I remain, Sir, your obliged,
CONSTANT READER AND WELL WISHER.

January 25, 1841.

SLIDE RULE BIBLIOGRAPHY.

Sir,—A constant purchaser from the commencement, and an occasional writer in the *Mechanics' Magazine*, would feel much obliged to any reader of that very useful and valuable repository of facts, if he would inform the writer where Laker's tract on the Slide Rule is to be purchased; several London booksellers have been applied to, but they all say they know nothing of it. They suppose it to be a provincial publication, and that it is not kept for sale in town. The writer is exceedingly anxious to have a sight of Mr. Laker's publication; he has been led to suppose that it is little more than a piracy upon that elegant little bijou on the same subject, which appeared a few years since from the able pen of the very ingenious Mr. Woolgar, of Lewes.

The same writer is in possession of a very old carpenter's rule, which has a slip of brass, containing a reversed radius, made to slide upon the girt line, and which gives it immense power over the common rule—it is stamped "*Bradford and Hull's Patent;*"—was such a rule ever patented, and when? Is it now on sale? Is there any pamphlet to be had which contains its description and use? where are they to be obtained?

A few years since a little difference of opinion displayed itself among some writers in the *Mechanics' Magazine*, as to who first proposed the reversion of the slide.

The earliest mention of the reversed slide that has come under the present writer's notice, is in page 187 of Hunt's "Mathematical Companion," 12mo. 1697.

The next mention of the reversed slide is to be found in the 1st edition of "Dougharty's Gauging," published in 1707; he it certainly was who first proposed the inverted line, now generally marked M D, for malt gauging, and which inverted line was then approved of, and adopted, by the Commissioners of Excise; it was by them ordered to be placed on the Exciseman's rule, and it has been in common use ever since.

The present writer would be very much pleased to see a good *general* treatise on sliding rules—such a one as would apply both to those with *one* slide, and to those with *two*. It would be no difficult matter to draw up such a treatise—sufficient of the *rationale*, and *abundance* of the *practice*, might be contained in a pamphlet—yes, in a small pocket manual. Mr. Woolgar can do all this well if he chooses—Why does he not? Let him hold pirates in defiance.

L. R.

January 7, 1841.

[Mr. Laker's "Treatise" was published at Chichester, where Mr. L. resides.—ED. M.M.]

HAWKINS'S EVERLASTING PENS.

Sir,—I willingly bear testimony to the *excellence* of Mr. Hawkins's pens, but I at the same time concur with "P. O. P," that they are *high priced*. Entertaining this opinion, I was much surprised to find Mr. Hawkins talking of advancing the price. I cannot forget (what he has omitted to men-

tion to you,) that he HAS twice advanced their price—when they were first issued their price was *ten* shillings—afterwards *fourteen*, and now *one guinea*. This is something like "eleven buckram men grown out of two."

Yours,

BANG.

London, Jan. 23, 1841.

THE LATE WILLIAM HAZLEDINE, ESQ.—FARTHER BIOGRAPHICAL PARTICULARS.

[From the *Shrewsbury Chronicle*.]

We promised in our last to carry out a little farther our sketch of the character of Mr. Hazledine, and are enabled to give the following characteristic anecdotes, which probably will convey a better notion of his character and conduct, than a more detailed narrative:—

Mr. Hazledine's character for accuracy and promptitude was formed in very early life by an incident, to which he never ceased to trace his success. A cargo of French burs having been landed at Bristol, it struck him that a good trade could be made out of their manufacture into millstones; but being without spare capital, he started off to his relative, Mr. John Hazledine, to try to borrow £60, wherewith to attend the sale. "Have you any security," said his uncle, "that you will repay me the money." "None," said William, "except my own conduct." "That's enough, lad," said the generous donor; "but one other guarantee I shall require, which is this:—name your day for repayment, and let it be distant or near as best suits you; but if you wish to please me, or succeed in the world, attend punctually to your promise; and you will never lose a friend, and very seldom require one." The remark of his uncle struck deep into the mind of the speculative borrower, who took the money to Bristol, and made such a purchase, as enabled him to enter on a lucrative branch of trade, in which he ever after held a high character. The borrowed money was punctually returned on the promised day; and the advice of his uncle was the rule of his conduct throughout life.

So precise and accurate was he also in his other affairs of business, that no transaction, however insignificant, passed unrecorded. His pocket-book was the chief record of all his intentions, and their execution; the first entry therein being made on the morning of the first of January, in the words, "paid for this book, 4s." and thereafter followed each transaction, down to the close of the year. These books he carefully retained; and could thus, at a glance, inform himself of the minutest occurrence in his business, or his family, for the last half century. Some of these records are exceedingly interesting, being expressed in his own forceful style; and, strange to say, where a corner of a leaf remains otherwise unappropriated, it is often filled up with a verse or two of rhyme, as remarkable for its deep feeling as its nervous terseness.

It was long an object of Hazledine's greatest ambition, to construct some public building in Shrewsbury, which would carry his name down to another generation with the same halo that surrounded it in more distant places. With that view, and seeing at a glance the admirable opportunity which offered itself of connecting Kingsland with Shrewsbury by a bridge, and rendering that beautiful suburb an integral part of the town, he offered to construct an iron bridge from the Quarry to the opposite side, making such approaches and embankments as would render the street, from St. John's-hill to the House of Industry, an easy and pleasant walk; and he offered a thousand pounds towards its erection, to which the late Mr. Pelham offered to contribute a similar sum. The project fell to the ground, from some party motives and fantastic fears that it would interfere with the House of Industry—that bugbear, which has prevented the success of more hopeful schemes than all our other public nuisances put together; but his want of success did not prevent him from embarking largely in all other public-spirited improvements. He lent the aid of his head and his purse to the construction of the new race-course; he has done more for the improvement of the public streets, at his own cost, than the Street Act Committee, with their yearly revenue of £1500;—he offered his services and his purse for the formation of a new Cattle Market at Kingsland;—he assisted liberally in lowering the hills on the Wyle Cop and Castle Gates; and finally, his last public appearance was in the Committee-room of the Shrewsbury Railway Company, where he expressed a hearty wish that his life might be spared to see this great project carried into execution, and offered his thousand or more pounds towards its completion.

About 30 years ago an action for damages was instituted against Mr. Hazledine, on the ground that the dam of a mill in his occupation did injury to some meadows belonging to a litigious neighbour. The case was opened at our assizes, and the judge (Mr. Justice Lawrence, we believe) recommended the parties to submit to two referees.—Hazledine's counsel turned round and advised Mr. Hazledine to accede to the opinion of his Lordship, but he got up and firmly addressed the Judge in these words:—"My Lord, I came here to have this case tried before your Lordship, and not to have it submitted to reference." The Judge answered with

some asperity, and very emphatically, "Very well, Sir, you *shall* have it *tried*, then!" The trial proceeded, and at last Hazledine himself (who had not put even the name of the witness in his brief) ordered a Land surveyor to be called, who had taken the level of his mill dam and that of the plaintiff's meadow, which proved that the meadow was actually *above* the possible leakage from Mr. Hazledine's water. This, of course, settled the case. After the verdict was pronounced in Hazledine's favour, the Judge asked him why he would not submit to a reference as advised? "For this reason, my Lord:—it often happens that two referees make a half-and-half thing of it, by blaming both parties; and I was so well satisfied I had done no injury that I would not submit to be punished." "You have done right," said the Judge, "it was a fit case for a Jury." We must add, that Hazledine was always very averse to litigation; but in the present case he knew the parties he had to deal with.

A transaction with the late Mr. Pelham, M.P., of this town, relative to Cound Mill, was a source of great fun to Mr. Hazledine, who often told it with much glee. These two originals met one day near the Post-office, and Mr. Pelham told Hazledine, that as he wished to remove Cound Mill nearer to the water which drove it, he would be glad if Hazledine would immediately set about the job. Hazledine, somewhat astonished, said, "Wouldn't it be better to bring the water nearer the mill, than to demolish the building to bring it nearer the water?" "I don't want your advice," says Mr. Pelham, turning on his heel and walking off. "I don't want your job," replied Hazledine, driving his gig onwards to his residence; and the pair continued shouting, "I don't want your advice," and "I don't want your job," till they were out of each others' hearing. Eighteen months thereafter, not a word having passed between them on the subject during all that time, Mr. Pelham walked into Mr. Hazledine's office, and briefly asked him to "do the job at Cound," which Hazledine answered by a nod; and the work, involving an expenditure of many hundred pounds, was completed without another word passing between them!

Mr. Hazledine had less than most men of the rank to which he had elevated himself, of that false pride which would pass by an old friend because he was poor. A laughable incident, characteristic of all his conduct in cases of this description, took place some years ago at Chester. He had been building a bridge for the Marquis of Westminster, near that city, and, being the race week, he one day went on the course in his gig. The first man he met whom he recognised, was a workman of his own—a soul framed of unquenchable thirst—who had gathered a crowd around him listening to the warbling of the mellifluous song of "Giles Scroggins." Hazledine was wonder-struck at the spectacle of his own workman, whom he had left comfortably at work in Shrewsbury, thus engaged on the Chester race course; and, stopping his gig till the song had ceased, he roared out, "Jack, lad, what bringst thee so far from home? Dostna thee want a jug o' drink to clear thy pipes?" "Aye, God bless thee, master," was Jack's answer, "or I'll never see ou'd Coleham again, for the ruck o' cheese-chawers here have only given me a halfpenny for two hours' singing." Hazledine desired him to step into his gig, and taking him to the stand, crammed him full of what was there to be obtained, telling at the same time all his friends of the queer manner in which he had fallen in with his old fellow-workman; and next day clothed him in a new suit, and sent him off by the coach to Shewsbury.

In the year 1829, Mr. Hazledine was the warden, or head officer of the "Incorporated Company of Ironmongers," &c. He was fond of any pleasure which gave happiness to the working classes and all around him, and therefore patronised what is called "Shrewsbury Show," a kind of Saturnalia which is now abolished. As warden he wished to exhibit himself in all dignity; and in a mirthful moment wrote the following rhymes to Mr. C. T. Clarke, in Mardol:—

Dear Sir,

If your Windows have room
On Monday at noon,
I am going to ask as a favour,
Four Ladies from here
Will about that time appear,
To look at the sports of The Show;
And to view with surprise
The bustle and noise,
And Harry the Eighth, in the Row.

I had almost forgot
One deep in the plot—
I mean VULCAN, the Man in the Armour.
You and I should not rest
Half so sound or so blest
Were it not for the sound of the *hammer*.

If the least inconvenient, say so.

Yours sincerely,—W. HAZLEDINE.

We have a strong opinion that Hazledine's character and natural abilities were somewhat moulded and inspired by the fame of Brindley, the great navigator, who executed the designs of the Duke of Bridgewater. At the time of Brindley's death, Hazledine was about nine or ten years old, and Brindley's fame was little known or valued until several years after his death.

There were many traits in Hazledine's circumstances and character similar, and some dissimilar, to those of Brindley. The education of Brindley was neglected—so was Hazledine's. Brindley bound himself ap-

prentice to a millwright—such was Hazledine's early employment." Brindley never indulged in the common diversions of life—Hazledine, on the contrary, mingled in all enjoyments which made people happy. Brindley lay in bed to consider of difficulties—but, on the other hand, Hazledine said to the writer of this sketch, "When I have been in difficulties, I did not lie in bed to think of them—*I* always get up and face them."

In about concluding, for the present, this notice of Mr. Hazledine, we exult in claiming for Shrewsbury the residence and benign influence of such a man. His loss will be deeply felt by his attached friends, and the working classes.

> Alas! for them—though not for Thee—
> They cannot choose but weep the more;
> Deep for the Dead that grief must be
> Who ne'er gave Cause to mourn before.

The property accumulated by the deceased during his long and active life, he has distributed chiefly among his children, relatives, and servants: directing that his foundry and other works shall be continued for at least twelve months after his death. The property bequeathed is very considerable, he being possessed at his death of upwards of two hundred houses in Shrewsbury; besides foundries, forges, brickworks, timber-yards, canal, gas, and insurance shares, and stock-in-trade to a yet unknown value.

On the Sunday after Mr. Hazledine's funeral, the Rev. Vicar of St. Chad's took advantage of the occasion to deliver a very eloquent and affecting discourse on the melancholy event. Towards the middle of the sermon a comparison was made between the shortness of human life and the work of men's hands, when the Rev. Gentleman thus apostrophised his hearers—

"Need I remind my audience of the far-famed works of art, which, after the lapse of ages, are, even now, monuments of Grecian, Roman, and Egyptian enterprise? But instead of mentioning the works of other nations, have we nothing in our own highly favoured land, that proves the self same truth? Are there no cathedrals, for instance, whose majestic structures speak of a thousand years, while their builders, perhaps, numbered only three-score years and ten? Are there no great works accomplished in this our generation, which will tell to future ages, that while the monuments remain, the head that planned them is silent in the dust of death? And may I not speak of the skill and enterprise, and handy work of him, whose mortal remains were yesterday consigned to the tomb of our own churchyard? Of him, whose skilful labours both at home and abroad, remain to be admired by children's children, which wondering thousands have already beheld, spanning as they do, with colossal greatness, not only the foaming torrents of mighty rivers, but also the raging billows of the deep? May I not refer to his love of industry and perseverance—of his delight in encouraging industrious habits among the hundreds, who will long and deeply lament their beloved employer? His loss, they doubtless both feel and acknowledge, to be a loss indeed! And, with respect to his kindly disposition and warm-heartedness as a friend, and husband, and parent;—but here I must pause—for, it may be, that I have touchde a chord which will vibrate to the heart of some member of his family circle. I will only add, in connexion with my text, that blest as he was with health and strength for nearly fourscore years, yet, how soon are they gone and fled away; soon, even when compared with the work of men's hands."

ON ROTARY AND RECIPROCATING STEAM ENGINES, AND ON THE SUPPOSED LOSS OF POWER FROM THE USE OF THE CRANK.

[The following comparative view of the advantages of reciprocating and rotary steam-engines, including a very complete exposition of the fallacy of attributing a serious loss of power, to the employment of the crank as the means of converting rectilinear into circular motion—has just appeared in the 118th Part of the *Encyclopedia Britannica* — Art. Steam Engine. As it bears strongly upon a subject, in which many of our correspondents have taken a great interest, and is written in a very practical, as well as philosophical spirit, we feel assured that no apology is necessary for transferring it to our pages.] ED. M. M.

"The steam-engine being now most generally used in our workshops, our manufactories, our steam-ships and our locomotive engines, for the purpose of *turning round* certain axles or wheels with a continuous whirling or revolving motion, it has appeared to many the simplest, the most elementary, and the most appropriate manner of applying the moving power, that the steam should itself follow the wheel which it turns, round the circumference of its circle of gyration, and so it is supposed, by acting immediately and directly on the wheel to be turned round, produce the most powerful effect. In this way the action of the steam would be made to resemble the turning of a mill-wheel by the action of the water on the buckets of its rim; and the arrangements by which such

an elementary mode of action might be brought about, from what is called a "Rotatory Steam Engine."

"That simplicity of form and of outline are essential to simplicity of action, and excellence of mechanical action, is a fallacy; that simplicity of figure and fewness of parts are objects of higher importance in machinery than durability, precision, and economy of operation, is a fallacy; that such an elementary machine, if constructed, could give forth any more of that power than is now rendered effective by the common steam-engine in every-day use, is a fallacy, arising in ignorance, and ending in disappointment.

"We have to state with regret, that very injurious consequences have arisen from this popular error. Many men of high talent and inventive genius have sacrificed their talents, their industry, their lives, to this delusion. The patent offices of England, Scotland, Ireland, France, and America, the mechanical periodicals of them all, the transactions of societies for promoting the arts, the "machines approuvees par l'Académie," the journal of the Franklin Institution, all teem with inventions of rotatory engines, and substitutes for the crank of the common steam-engine, by which power and simplicity are to be united in the highest degree. And yet, when we look around us, we nowhere find that a phalanx of talent thus concentrated with a singleness of purpose, and an indomitable perseverance worthy a more hopeful object, has ever been successful in producing one form of mechanism to stand in competition with the common every-day reciprocating engine, with its crank and its fly-wheel, and all its much condemned appendages. In this country alone a host of inventors have not only proceeded so far as to expend their ingenuity, labour, and money, in inventing and constructing machines of this class and making them the subject of experiment, but more than a hundred of them have actually laid out in succession four or five hundred pounds a piece in procuring the royal grant of monopoly for their valuable contrivances. We feel it, therefore, to be our duty to give a full and uncompromising exposure of the fallacies of the rotatory engine.

"We regard such a fallacy as a grievous obstruction to the advancement of the arts and the industry of Great Britain. It is to the prevalence of ignorance on this subject, that much of the misdirection of mechanical talent, in so far as it has been applied to the improvement of our prime movers, is to be attributed. Again and again, year after year, do we find the same machine invented and re-invented, and the same experiments repeated, and the identical failures encountered. Of these failures, however, there is only a small number comparatively which comes before the public. Those alone which obtain patents are dragged into light; and of those we are only left to infer the subsequent failure, from the circumstance of discovering that their existence is recognised nowhere except in the parchments of the patent office. It is indeed a matter of general regret, not limited to the subject of rotatory-engines, that false pride should prevent men from publishing the results of such experiments as may not be perfectly successful in accomplishing the objects originally intended. It should be recollected, that, as evidence of the truth or falsehood of some great principle, no experiment is valueless, if simply and faithfully described; and that, if it do not serve as a signal-post to point the way to truth, it may at least prove useful as a beacon to warn from the path of error. It is to unsuccessful experiments that we owe many of our most valuable scientific discoveries. The failure of an attempt to make a sucking pump more than 33 feet high, led to an acquaintance with the doctrine of atmospheric pressure, and opened a new field of research to the genius of Galilei, Torricelli, and Boyle; and Sir Humphrey Davy is reported on an occasion where he was shown a dexterously manipulated experiment, to have exclaimed, "I thank God I was not made a dexterous manipulator, for the most important of my discoveries have been suggested to me by failures."

"Thus we find that the record of error may often prove a contribution to truth; and the man who is sufficiently unselfish to impart to others the benefit of such experience, is the disinterested friend of science. Had all the failures of the rotatory engine been publicly recorded, that avenue of misdirected effort would long ago have been closed.

"Let it be recollected that the only office performed by machinery, is the transmission of power from an animal or element, and never the creation of power. It can modify motion in direction, velocity, and force, so as to expend itself in one manner rather than another, but it can never create motion or generate power. This is true, or all the experience of the laws of matter which has been obtained since the use of inductive philosophy, is false. Solid matter may obey force, and modify it, but can never create power. The only enquiry to be made, therefore, in regard to any engine is this; when force is applied to the machine, whether the force of steam or any other, does it turn all the force of the agent to a useful purpose, without further diminution than is occasioned by necessary friction and resistance of the air, and the least possible loss of power by transmission? When steam bursts a boiler, or water overturns the embankment of a reservoir, the power of heat and of gravity pro-

duces its full effect; but it is not a useful effect. The object of a machine is to expend it parsimoniously in rendering the greatest portion of its effect useful. The only question entertained is, which form of engine is best calculated for converting the power of steam to a useful purpose, so as to do so with the smallest diminution in its quality? The common, or reciprocating steam-engine, is distinguished from the rotatory steam-engine by the nature of certain parts of its mechanism, which convey the motion of the steam to the machinery which is to be moved; these are a piston-rod and crank. Now, it is owing to a radical misconception of the nature of this elementary machine, the crank, that innumerable schemes have been devised for the production of circular motion, without the intervention of the crank, either by giving to the steam itself an immediate circular action, or by the substitution of some other less elementary mechanism between the reciprocating piston and the revolving axis, as the means of producing its rotation. In the most common form of the rotatory engine, the cylinder, piston-rod, and cranked axle are superseded by a cylinder, valve, stop, and axis. In the same way as a mill-wheel is compelled to move in a circle, either by the direct action of water or wind upon it, so is the drum, or wheel, with valves, fans, or other projections on its circumference, urged round by the force of the steam, and, enclosed in an outer cylinder, or case, gives revolution to an axis to which it is attached. This direct rotatory action of the steam will, it is imagined, give out the effect of the steam more powerfully, uniformly, and economically than the common mode of reciprocating action when converted by the crank into revolution.

"Although the name of Watt has been included in the list of inventors of substitutes for the crank, it should be observed that he was only driven to the invention of a substitute by the circumstance of a patent having been previously obtained for the crank in its simplest form; and that he abandoned this beautiful, but more complex, mechanism on the instant that the elementary crank was released from the fetters of monopoly. It is due also to his memory to say, that the sun and planet wheel, which he substituted for the crank, is a disguised crank, possessing all the valuable properties, excepting simplicity and smallness of friction, which give to the crank its present eminence as a means of obtaining rotatory effect. It is remarkable that the fallacies regarding the now universally employed crank were coeval with its first suggestion as the vehicle of rotative steam power. John Stewart, in describing this mechanism for this purpose, in the *Phil. Trans.*, 1777, observes, that 'the crank or winch is a mode of obtaining the circular motion which naturally occurs in theory, but in practice it would be impossible, from the nature of the motion of the engine, which depends on the force of the steam, and cannot be ascertained in its length; and, therefore, on the first variation, the machine would either be broke to pieces or turned back.'

"Mr. Smeaton agrees with Mr. Stewart on the inapplicability of the crank; but adduces another objection, 'that great loss would be incurred by the absolute stop of the whole mass of moving parts, as often as the direction of the motion is changed, and that although a heavy fly-wheel might be applied to regulate the motion, it would be a great encumbrance to the mill.'

"In such phrase of evil omen was it thus confidently predicted that the simple means now in every-day use for the communication of steam power to revolving machinery would either be attended with great loss, be very desultory in its action, or altogether break the machine to pieces. At that time, however, the crank was not in use; but the very same objections are still urged by those who have, every day, before them the practical confutation of their assertions.

"In the abstract and purely theoretical view of the subject, it can be shown that the present mode of applying the steam possesses none of the disadvantages, and that the rotatory mode possesses none of the superiority attributed to it.

"In making the comparison between the rotating and the reciprocating piston, let it be supposed that the vessels containing the steam are equally rigid, equally perfect in their form, and are equally divested of friction, and that there shall have been obtained for the steam a *point d'appui* as satisfactory in the case of the rotatory, as that which the reciprocating engine possesses in the ends of the cylinder; then upon this hypothetical position, neither engine will excel the other, each will move over a space with a power and velocity proportioned to the steam which it makes use of, and that engine will do most work which uses the greatest quantity of steam.

"The great fundamental principle in the construction of machinery is, that the work done depends in quantity only upon the quantity and velocity of the power applied, and not at all upon the form of the machine; in other words, that a machine has no power either of consuming or creating motive power; that it can only transmit it; that it can only modify it to suit particular purposes; and that what it loses in pressure it will gain in velocity; this is on the supposition, of course, that the machine is perfectly well made, without friction, and without

permitting the escape and waste of power in some effect not conducive to the end in view. Setting out, then, from this great fundamental principle of virtual velocities, we might satisfy ourselves with asserting the truth we now wish to establish as a simple, self-evident deduction from it, and conclude that from this great principle of virtual velocities there could not possibly be loss of power by the crank steam-engine.

"This summary process would not, however, satisfy the enquirer or inventor who has taken the erroneous view of the subject, unless he were given to understand how this great doctrine may be made to bear on the peculiar difficulties of the case. He will return upon us with the question—'How is it that, in the common crank, we are able to show that, at two given points in its revolution, the position is such that an infinite power would produce no effect at all; that there are only two instants of time in which the force and its effect are equal; and that, at every other point, the pressure given out by the steam to the crank is less than the original pressure of the steam on the piston? How is this inconsistency to be reconciled?' We think it right to give a direct answer to this question, because a considerable authority, Mr. Tredgold, has committed a grievous error in reporting, and apparently demonstrating, that the rotatory and crank-engines actually differ in theory in the proportion of three to two, the proportion being against the rotatory engine; whereas, if they be not equal, our whole system of mechanics since the time of Galilei has been resting on a fallacy.

"Let it be recollected, then, that at the two extremes of the line of centres the greatest loss is said to take place. Now, here the fact is, that it is impossible there can be loss of power, for there is no power at all exerted; there is no steam in action. It is forgotten that, at this point, the communication which supplies the steam from the boiler has been cut off. The steam on one side the off piston having done its work, only waits to be released from the chamber, and escapes on the instant of the opening of the eduction valve, and at the same instant is in the act of being permitted to enter on the opposite side, for reversing the motion. At these points, therefore, all application of force has ceased, and arrangements are making for reversing the motion; and as no power is applied, none can be lost.

"In regard to the remaining points of the circle, at which is said that power is lost, it is easy to show that the velocity imparted to the crank is such as to be an exact equivalent to the force which is apparently lost.

"The following table presents the results of very accurate calculations of power and velocity, showing that the velocity at a given point in the circle is increased exactly in the same ratio as the force or pressure is diminished, so as at all times to present the same dynamical equivalent. The table extends from one neutral point to the other neutral point of the orbit of the crank, comprehending a semicircle divided into ten equal parts. The first column indicates the point in the semicircle at which the force and velocity are estimated; the next column shows the per centage of the direct force of the steam on the piston, which is given out in pressure upon the crank of the engine; and the last column, the velocity given out at each point.

Place of the Crank.	Per centage of power given out in pressure.	Relative Velocity.
0°	0.00	Infinite.
18°	30.90	3.236
36°	58.78	1.701
54°	80.90	1.236
72°	195.11	1.051
90°	190.00	1.000
108°	95.11	1.051
126°	80.90	1.236
144°	58.78	1.701
162°	30.90	3.236
180°	0.00	Infinite.

"From this table it is evident that when we take note, as we must do in every correct estimate of power, both of force and velocity, the crank has at each point the equivalent in greater velocity for less force.

"The numbers in the second column also represent the velocity of the piston in relation to the crank, so that when the velocity of the crank is uniform, the velocity of the piston, or the steam consumed, which is proportional to its velocity, is in the exact ratio of the pressure on the crank.

"The last consideration which we shall submit upon this part of the subject is, that if the average of the pressures on the crank be taken for every point of its orbit, it will amount to about 63.3 per cent. for the whole circumference of the circle. Now, as the same circumference of the orbit of the crank is greater than the stroke of the piston in the cylinder, the whole space described in a given time by the crank is greater than the whole space described by the piston, also in proportion of 3.1416 to 2; so that if we combine the greater length of the whole orbit with the force on it, we shall have an exact equivalent to the greater force on the piston moved through a smaller space.

"The error of Mr. Tredgold lies, not in his estimate of the effect of the crank, but in his estimate of the effect of the steam in the rotatory engine. By a strange oversight, he gives a statement of its power as much over the truth, as that of the crank is generally

stated under the truth. We admit that, in the first abstract view of the subject, the rotatory is theoretically a perfectly efficient propagator of power, and we have merely designed to show that in theory the crank has not the faults usually attributed to it, and is also a perfect machine. We shall by and by show what the considerations are by which the impracticability of the rotary scheme is exposed.

"It appears, therefore, that the power of steam is by no means disadvantageously applied through the medium of the crank in the ordinary way, because, 1, the velocity of the crank is in the inverse ratio of the pressure upon it; 2, because the mean pressure on the crank during the whole revolution is less than the pressure on the piston, only in the proportion in which the whole space moved over by the latter is less than the space described by the former, so that the whole effect is equal to the whole power; 3, because the steam is not at all expended at the neutral points, and because its expenditure is at every point exactly proportioned to the pressure which it gives out, the velocity of the piston being in that ratio. In theory, therefore, the ordinary crank possesses no inferiority to the rotatory machine, as an engine for applying the power of steam to revolving machinery.

"II. In a practical point of view it may be shown that the rotatory steam-engine is greatly inferior to the common reciprocating crank-engine in simplicity of parts, easy construction, cheapness, amount of friction, compactness, precision and uniformity of work, and durability and economy in use; and that it does not possess any of the peculiar applicability that has been attributed to it, to the great purposes of inland navigation and railway transport.

"1. *Simplicity.*—A little unfairness is sometimes inadvertently used by inventors of rotatory engines, in making comparisons with their machines and the common crank-engine; they select the large beam engine, with all its conveniences and appendages, and compare it with the simplest form of the rotatory engine; but in justice we may be allowed to take the simplest form of both. Now, there is a simple form of engine used both in America and in this country, of the oscillating species, as it is called, and this species of reciprocating engine consists only of the following parts:—Cylinder, piston, and cranked axle; there are are no valves or further mechanism of any kind, so that where simplicity is the first great requisite, this kind may be used with advantage. The rotatory engine of the most simple species must have its drum, diaphragm, piston, and

"If we take those forms of the rotatory engine which require valve gear, air-pump, condenser, force pumps, &c., such appendages will have no advantage of any kind in either form; but in working the pumps which are themselves reciprocating, the reciprocating engine will have the advantage of more direct, immediate, and simple action; for in the rotatory engine additional mechanism is necessary to convert the revolving motion into one calculated for reciprocating pumps.

"2. In case of construction the simple form of reciprocating engines incomparably excels the rotatory. To possess equal powers the rotatory drum would require to be of much larger diameter than the reciprocating cylinder; and the difficulty of construction increases in a high ratio with the diameter. The diaphragm is also a sliding or revolving piece of mechanism, whose rubbing surfaces require the greatest precision of workmanship. The revolving piston is also a practical problem of the greatest difficulty, and one which has never been satisfactorily solved, for if it be rectangular with plane surfaces, it is scarcely possible to make its surfaces steam tight; and if it be a circular and revolving piston, its surface and that of its drum become surfaces of double curvature, and the difficulty is then prodigiously increased. The metallic piston of the common steam engine is the most perfect and most simple piece of mechanism, which can be made by a very ordinary workman, and which, if imperfectly fitted, will, in the progress of doing its work, become of itself every day more and more perfect. An editor of a well known practical journal, although a believer in the rotatory engine, speaking of one of its simplest forms, is compelled to admit "that there being no mode described of making the parts of the engine steam tight by packing, they must be all made so by accurate workmanship and grinding, the expense of which in the onset and in repairs would certainly be too considerable to allow it to come into competition with other steam-engines of a more common and practicable construction." This admission is equally applicable and fatal to all the forms of the engine.

"3. The cheapness and first cost of the engine will result from the two former points of inferiority, and will be further shown, from those which follow, to be greatly and necessarily in favour of the common engine. Not only are the parts, from their nature, more easy of construction, but the extent of polished surface will be shown to be much greater in the rotatory than in the reciprocating engine.

"4. The quantity of surface exposed to friction is greater in the rotatory engine. Let it be recollected that in the rotatory

engine, the piston describes the semi-circumference of the circle, while the piston of the reciprocating engine is describing the diameter of it. Let it also be recollected, that the reciprocating piston passes back through the returning stroke, over the very same surface through which it formly descended, while the rotatory piston necessarily revolves over a new surface, forming the other semi-circumference of its orbit.

"Let it also be recollected, that the form of the reciprocating cylinder may be so proportioned, that it may have a minimum of surface, while the length of the circuit of the rotatory piston prevents the possibility of giving it a proportion to the radius of the piston, by which this object would be obtained: for it would be equivalent to making a circle whose diameter should be equal to its circumference, which is impossible. It is impossible, therefore, that the friction can ever be as small in the rotatory as in the reciprocating engine.

"5. *Compactness.*—It follows in like manner, that the bulk and space occupied by the rotatory engine must be greater than in the reciprocating engine; for in the one case the piston must describe the circumference of a circle, whose diameter is greater than twice the radius of the piston; and in the other case it is only necessary that the piston pass through the diameter of it.

"6. In precision and uniformity of working, its inferiority will be rendered manifest under head III., when the peculiarities of the crank are explained.

"7. In durability and economy in the wear and tear of ordinary working, the rotatory must, from certain elements in its constitution, be necessarily far inferior to the common engine. It contains in the very nature of its action, elements of speedy destruction and expensive and frequent repairs, so that it can never become an economical engine. Before proceeding, however, to demonstrate the cause of this inferiority, the fact of this inferiority, as existing in all previous engines, we shall adduce from the unwilling evidence of a friend to rotatory engines. Speaking of Mr. Holliday's engine, he says that, "the extreme accuracy and nice fitting of parts necessary for it, will make it very difficult to execute, and very easily deranged. Rotatory steam-engines possess considerable advantages both as to speed and economy of power, and would therefore be preferable if they could be made to work as well for a continuance, and be as easily kept in good order as common alternating steam-engines? but from their being so very seldom used, we apprehend that this is very far from being the case with any of them at present, and that the production of a rotatory steam-engine possessed of these necessary qualities, is still an object of research." So far the Editor of the *Repertory of Arts*, in testimony that the rotatory steam-engine *never has* been made to work durably and economically; we now go on to show that it *never can*.

"It is essential to the durability of a machine that its parts should wear uniformly, and that, if possible, the mere process of wearing should make them fit each other more closely. This is pre-eminently true of the piston and cylinder of a common reciprocating steam-engine. Its piston, cylinder, and valves fit more closely as they wear, and are worn with perfect uniformity, so as not to require repair until, by long working, the whole thickness of matter in action shall at length have been consumed. This is the perfection of mechanism, and it is admirably exemplified in the metallic piston of a steam-engine, which, working night and day, will require no repair of any kind until, after a long period of years, the whole strength of the metallic rings shall have been consumed.

"In the very nature of the rotatory piston, this uniformity of friction, this increasing adaptation of surfaces, this permanence of the best working condition is impossible. A common reciprocating steam engine attains its best working condition after it has wrought for some years; but a rotatory steam-engine, if it have been brought by care and precision of workmanship to a state of high finish and perfect accuracy, so as to work well for a day, commences from that moment a rapid course of deterioration, every succeeding degree of which accelerates the progress of decay; a decay which can only be retarded by continual, laborious, and expensive repairs. The following considerations may render obvious the nature of the elements of self-deterioration in the constitution of a rotatory steam-engine.

"Suppose two perfectly flat plates of polished metal perfectly round to be laid one upon the other, so as exactly to coincide at every point: let the uppermost be so made as to turn round on an axis while in contact with the other, and let a rapid motion be communicated to the uppermost; let us consider what the result of the attrition of one of these upon the other will be; will they wear equally, so as to remain in a state of mutual adaptation, or will they not? Experience furnishes us with a reply that exactly quadrates with a reasonable expectation: they will not wear equally, they will not retain their form, they will not remain flat; they will wear away most rapidly at the circumference, and wear open there while they are quite close at the centre. Let it be considered that the outer edge performs a larger circuit than a part nearer the centre; that, therefore, since all the parts

revolve in the same time, those nearer to the circumference move with greater velocity than those towards the centre; that the attrition is consequently most rapid at the circumference, and diminishes uniformly towards the centre of the plates; and it necessarily follows, that towards the edges the plates must commence an immediate and rapid waste, while the centre remains uninjured. This result is established as matter of experience. It is a circumstance that has caused the failure of many beautiful inventions. It is the reason why conical bearings have been universally abandoned for cylindrical ones; and it is the reason why a most beautiful class of inventions has been totally useless to the improvement of the common steam-engine; we refer to the revolving valves invented by Oliver Evans and by Murray, but now universally abandoned, in spite of their simplicity and original cheapness, on account of this inequality in the attrition of flat surfaces revolving round a centre.

"The application of the result of this illustrative experiment to the subject in question is abundantly obvious. The rotatory piston is necessarily and inevitably of this nature. Performing a circuit round a centre, different portions of the bearing surfaces subjected to pressure, and necessarily in contact and requiring to be steam-tight, revolve at unequal distances from the centre, and therefore with unequal velocities; hence the circumferential surfaces, under this excessive attrition, wear more rapidly, and become unfit for use long before the central parts have suffered any sensible effect. It is to this difference of velocity and of attrition, arising from the necessary circumstance of motion round a centre, which renders it impossible to keep the rotatory-engine in a working condition with advantage, and from which it follows that each day's work renders the engine less fit for the duty of the succeeding day.

"8. The peculiar applicability of the rotatory form of steam-engine to the purposes of steam navigation and land locomotion, has been much insisted on by projectors of rotatory-engines. To both these purposes it is, from its form, supposing it to possess no other disadvantage, most inapplicable. In a steam-vessel it is first of all desirable to have the axis of the paddles as high as possible, and the weight of the engine as low as possible. Now if the engine be placed on an axis, which is the case in this application of the rotatory engine, one of two evils is incurred; either the axis of the wheels must be brought low, which impairs the action of the paddles, or the weight of the engine must be exalted so as to render the vessel top-heavy, unsteady, or, as it is technically called, 'crank,' and liable to be upset. By the ordinary engine, the axis is elevated to or above the deck, while the weight of the engine remains on the floor, at the bottom of the vessel.

"Again, to the application of the rotatory steam-engine to the purpose of terrestrial locomotion in propelling carriages on railways or other roads, there are inseparable objections. As the rotatory engine is placed immediately upon the axle of the propelling wheels, there can be no springs between it and the wheels, so that every jolt would derange the machinery. The weight of the engine placed on the axle would in turn reciprocate the evil by knocking the wheels to pieces.

"In the reciprocating engine these evils are prevented by the detachment of the engine from the axle, and the propagation of power through rods, wheels, or chains, to the propelling wheel or axis; and if any fault still remain in the principle of locomotive engines, it is the want of perfect detachment in the very respect which the introduction of the rotatory engine would render impossible.

"In addition to all these obstacles which stand in the way of rotatory engines, it may be worth while to mention another circumstance of a practical nature which gives great superiority to the common steam-engine; we mean the facilities which it presents, and which the rotatory engine does not possess, for the attachment of the appendages that are indispensable to the functions of a perfect steam-engine. The subordinate parts of an engine which belong equally to a rotatory and reciprocating steam-engine, are, an air-pump, a feed-pump, and a well-pump. These merely require to be attached directly to the beam of the common engine, and they are worked without the intervention of auxiliary mechanism, because the motion of the pumps is reciprocating, and the action of the steam is also in the common engine reciprocating; while, on the other hand, in the case of the rotatory steam-engine, it would be necessary to convert the revolving movement, by a crank or other more complex mechanism, into the very reciprocating effect which it is intended to supersede.

"All these considerations, of a most important and immediate practical bearing, clearly prove that although, in the most abstract and elementary theoretical view of the subject, there be an apparent equality of effect in the rotatory and the reciprocating steam-engines, yet there are practical objections of an inseparable nature inherent in the very constitution of rotating mechanism, that prevents the possibility of rendering it more perfect.

III. "It is lastly our duty to show that the common reciprocating crank steam-engine, not only does not possess the disadvantage attributed to it, but that it possesses certain very peculiar properties which may not have been hitherto clearly understood and defined, but which nevertheless do adapt it in so admirable a manner to the nature of steam and of solid matter, and to the necessary imperfections of all human mechanism, as to have rendered it triumphant in universal practice over every competitor.

(To be concluded in our next.)

SUBMARINE PROPELLERS AND PADDLE WHEELS.

[From an article on the *Archimedes* in No. I. of the *Bristol Magazine and Western Literary Journal*, a new provincial journal of great ability and promise.]

Whether the *Archimedes* screw produces under ordinary circumstances an acceleration of speed or not we consider of very secondary importance; we have no doubt but it does and to an extent which will eventually appear very conspicuously; and we think the clear and able explanation on this point, in the letter of Mr. Roger Phillips, of Whitehaven, published in the *Mechanics' Magazine* for October, is conclusive; but the travelling public will regard this only as one of the minor merits of the screw-propeller. We are of opinion that a steamer, even on the old construction, is safer at sea, in all weathers, than an ordinary sailing vessel of the same size and trim, *as long as the engines and paddle-wheels continue in perfect order, and there are plenty of coals to keep them going;* but when any circumstance occurs to stop the machinery, and render it useless, we have no hesitation in stating that the common steam vessel becomes *the most helpless log that floats upon the waters:* and the situation of the crew and passengers is from that moment critical and dangerous. We put it to the captains of sea-going steamers themselves, whether, under such circumstances, they could ever gain one point to windward? and whether, in the event of a gale of wind, the utmost efforts of human ingenuity could get the vessel out of the trough of the sea, if she once broached to, which she would probably do almost immediately? It is notorious, that the *Erin* was lost from this circumstance. This unfortunate steamer was passed by several vessels in the course of the day, lying in the trough of the sea (as it is nautically termed), and was reported off Milford, distance about 20 miles, with signal of distress flying, the wind blowing at the time a gale, at North West; she must, therefore, some hours before she went down, have been within sight of land, with a fair wind, of which no use could be made.

When the *Killarney* also was disabled, she was some miles to windward of Cork harbour, and drifted all across its mouth, with a fair wind to run in. Even the loss of the *William Huskisson*, last winter (certainly that of the remaining passengers), may in a great measure be attributed to her complete helplessness, when the rolling of the water from the leak put the fires out; as she was several hours in distress before Captain Clegg, with the *Huddersfield*, came to her assistance: whereas, between Liverpool and Dublin, a fast sailing vessel, with a stiff breeze, is never above four or five hours' run from a safe harbour, let the wind be which way it will.

It was the knowledge of the fact, that the great shocks to which the ordinary machinery is subjected in a heavy sea, are very liable to put the engines out of order, and the great danger to which the vessel would then be exposed, which prevented for 20 years any attempt to establish a regular steam communication with America; and even now, although in such a castle at sea as the *Great Western*, with such enormous power, and so amply provided with remedies for almost every kind of accident to which she is exposed, one might not feel very apprehensive, as long as the provisions continued abundant; yet we question whether, in the event of her engines becoming effectually damaged, the renowned Hosken himself would not be very willing to exchange the commandership of this "mighty monarch of the deep" for that of a snug little schooner, of no more than 100 tons burden, even in the midst of the "broad Atlantic."

Now, with respect to the *Archimedes* (or any good vessel similarly appointed), not only is she safer than an ordinary sailing vessel, while her machinery continues effective—and much less likely to have this put out of order than it would be on the old plan, because the strain on it is always nearly equal—but she is also, to all intents and purposes, and in all situations, *even with her machinery stopped and rendered useless, quite as safe as any sailing vessel would be.* With her propeller detached from the engine (which can be done in one minute), it has been ascertained that she is as well able to "turn to windward" as a fast-sailing yacht; and "when her gaff-foresail came down by the run," says Captain Scott in his letter to Captain Chappell—(vide Report, p. 53)—"she stayed against a heavy sea, which proves her to be a very handy vessel."

We confess that, to us, this advantage appears immense; it makes all this difference;

that, whereas the safety of vessel and passengers, in the former case depends *generally altogether on the machinery*, in the new plan, on the contrary, the machinery is merely an additional means of speed, which, like a studding-sail, can be set or taken in at pleasure, and which may, and does, add considerably to the safety of the vessel, but *can never, under any circumstances, materially diminish it*; and, had this method been applied in the first instance, there would have been no more risk in sending steamers of ordinary size and power to America, twenty years ago, than there is now in navigating them to France or to Ireland.

When we have been exposed to a heavy cross sea, even in steamers of known and approved good qualities and great power, we could not hear, without some degree of nervousness, the thundering shocks which the engines had constantly to sustain, while, perhaps within a mile to leeward, the sea has been going bodily over the bold rocks of an iron-bound coast, from which nothing could have saved us had our machinery given way; but, in a similar situation, in the *Archimedes*, no anxiety need be felt; the engine would perform its duty with the same steadiness and regularity as before, or, if stopped, the vessel would be perfectly competent to continue her course with scarcely diminished velocity, (wind abeam,) under a press of canvass alone.

It may occur to some of our readers that, as other steamers carry sails also, surely they could manage to keep off the land as well as the *Archimedes*, in the case of damaged machinery; but they will understand us better when we tell them that under the circumstances just detailed, the *Archimedes*, supposing her to be able to carry all sail, would go probably nine miles an hour; (Captain Chappell states that in going from Southampton to Portsmouth her speed, under sails alone, never was reduced below eight knots, close upon a wind;) while we may venture to state that no steamers now navigating the Bristol Channel would be able, in such a case, with the additional drag of her paddle-wheels and boxes, to go above three miles in the same time, which being insufficient to counteract her lee-way, she would in all probability drift ashore in less than an hour.

As we have considered this point of distinction the most interesting to society at large, we have dwelt more upon it than we originally intended; and will now describe more briefly the advantages in point of *convenience*, which the screw-propeller possesses over the side-paddle-wheels. The first of these is, in our opinion, the ready obedience of the vessel to her helm in turning. Every one who is accustomed to travel by steamers must have been repeatedly annoyed by the tediousness of getting the vessel into her berth or landing place; even in wide rivers, affording considerable room, the running a-head and backing astern are often continued for nearly half-an-hour before the shivering and impatient passenger can put his foot on *terra firma*. Now, it seems the *Archimedes* will make a complete round turn in two minutes and a half, and in a circle whose diameter is about twice her own length—a most material consideration; and when we remember the many fatal accidents which have happened, by steamers running into each other, even when one party has seen and hailed the other in its approach (as in the case of the *Britannia* and the *Phœnix*, so lately), her great superiority in this respect is evidently more than a convenience. Paddle-wheel steamers obey their helms readily enough for ordinary purposes, and the vessel's head may be easily veered a point or two in either direction; but they are incapable of performing a rapid manœuvre. Probably one of our Irish packets, when running with the full power of her steam, would not accomplish a circle much within the circumference of a mile; it is impossible to say how much this circumstance may have contributed to the losses of the *Water Witch* and the *City of Bristol*. The error in both cases was discovered before the vessels struck, and the helm shifted, but not sufficiently soon to enable them to escape the danger

The next ground of preference of the *Archimedes* is her having no external paddle-wheels to agitate the water, or to impede the crowded traffic of our rivers.

The great number of accidents, attended with loss of life, which have happened on the Thames, from the paddles of steam-vessels either coming into actual contact with wherries and river-craft, or causing an overpowering swell in the immediate vicinity of deeply laden boats, render it somewhat singular, that the London authorities generally, and the Humane Society in particular, have not hitherto made any public demonstration in favour of a plan which obviates all the evils of the old system.

A steamer on the *Archimedes'* plan, is neither of greater breadth than a sailing vessel of similar tonnage, nor does she cause a greater swell: and she is so much the safer in threading her way among boats and vessels, from her ready obedience to the helm in either direction: and if it be ascertained, that the business of steam-navigation can be done, without the necessity of constant danger to the lives of boatmen and their passengers, in our rivers, it behoves those whose duty it is to provide for the public safety, to take measures for establishing it on such a

footing. We should be sorry to see enterprise disconcerted, or "vested interests" molested; but the humblest individual in society has a claim, paramount to either, on the consideration of the magistrate. Immediate interference would, perhaps, be premature and unjust; but the public would not be unreasonable in expecting, that from and after a date to be fixed on, no steamer should be allowed to approach within four or five miles of London-bridge, *under the action of side-paddle wheels;* and a similar regulation, adapted to local circumstances, will, we doubt not, eventually obtain at all other steam-packet stations. The great caution exercised in our own river (frequently attended with no little delay), renders accident here of more rare occurrence; but, commercially speaking, we are in still greater need of a substitute for wide-spreading paddle-wheels, on account of the narrowness of our river, and the entrance to our docks. That our Great Western Steam Company, therefore, should be among the earliest to appreciate Mr. Smith's plan, on a magnificent scale, will surprise no one who is aware of what they had previously accomplished; and we cordially congratulate them on their spirited determination to be the first to surpass themselves. The same wisdom and sagacity which has already enabled them to obtain the confidence of the public, has, we doubt not, led to the deliberate adoption of this noble invention; and their boldly resolving to apply it to a steam vessel of 3000 tons burden, does equal honour to themselves and to the inventor. It is no experiment: but a triumph of public spirit and laudable emulation over preconceived notions of excellence and perfectibility—and, as such, we doubt not the public will receive and appreciate it.

VELOCIPEDES.

Sir,—There have at various times been published sundry schemes for accelerating pedestrian paces, but like steam on the common roads they all appear at present to be "no go." Can any of your Correspondents inform me of any really *useful* and economical velocipede, which has borne the test of practice?

Yours, &c.
EVANDER.

January 28, 1841.

CAMBRIDGE MATHEMATICAL QUESTIONS.

The Editor of the *Mechanics' Magazine* is requested to allow a corner of one of his pages for the insertion of the following questions:—they were proposed at a Trinity College Examination, at Cambridge, some time since.

1. Given, $x + y + xy = a$
and $\overline{x^2 + y^2} \times xy = b$,
to find x and y in terms of a and b.

2. Find two numbers,—such, that the cube of each, added to the square of the other, may make rational squares.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM HICKLING B[illegible], OF WHARTON STREET, BAGNIGGE WELLS ROAD, GENTLEMAN, *for improved machinery for cutting and working wood.* Enrolment Office, December 24th, 1840.

The improvements comprehended in this patent are—Firstly, a new system of guides for boards while passing through the wood-cutting machines. The iron frame of the guides varies in shape in different machines; it forms a bed on which the guides traverse. The guides are formed of puppet-heads in pairs, one being fixed, the other moveable in order to hold and guide wood of different sizes. Moveable pieces slide over the inner vertical faces of the guides, and pressing down upon the upper surface of the wood it is thus held firm and steady.

Secondly, an improved mode of elevating and depressing the upper pair of rollers, when the wood is carried forward by their means. The axes of the upper rollers turn in blocks which slide up and down in grooves in the upright side frames of the machine. They are regulated by spur and bevil wheels, in conjunction with spiral springs, so that while the wood is firmly held, an elasticity is obtained by means of the springs, which allows any irregularities in the surface of wood to pass through the rollers.

Thirdly, an improved mode of admitting oil to the working parts, viz., the circular saws, shafts, spindles, &c. consisting of a cup with a tube at the bottom furnished with a stop cock, to be so adjusted as to allow any number of drops per minute to fall from the nipple into the channel leading to the bearings requiring lubrication.

Fourthly, an improved mode of sawing and dividing wood, so as to effect the planing at the same time; the arrangement being also applicable to veneer saws.

For this purpose, there are slots near the periphery of the circular saws, approaching as near to the edge as is consistent with due strength; in these slots side cutters are fixed, with their edges ground and set to the same angle as a plane iron. These cutters project slightly beyond the set of teeth of the saw; so that a shaving is continually taken off as the saw revolves. Or the edges of

such slots in the saw plate may be turned up and used in lieu of detached cutters.

Fifthly, the application of the foregoing construction with two or more sets of circular cutters, so as to form two or more strips of plain or ornamental moulding. To accomplish this, two or more circular saws are mounted on one spindle between which, instead of washers, blocks are fixed, holding the cutters in their upper edges. These are circular and may be either plain or moulded, and they project sufficiently to perform the necessary operation as rapidly as the circular saws can rip the scantlings or boards into strips,

Sixthly, an improved mode of forming moulding and other cutters. These cutters may be of any required shape, and are attached to blocks, fixed on the saw spindle by grooves and feathers. They are made of thin steel plates, screwed between two metal plates, which are worked down on each side so as to leave the steel edge projecting about $\frac{1}{16}$ of an inch.

Seventhly, a machine for preparing deals and baulks of timber for sawing. The wood to be operated upon is laid on a metal bed moved by a rack and pinion and slides on V pieces fixed to the floor. The apparatus for holding the timber is firmly secured to this bed; puppets are screwed to the sliding bed, their inner faces being made perfectly true. To these faces a cast-iron beam is attached vertically, so that it can be moved up and down, by nuts and screws, and serves to clip the upper part of the piece of timber.

The holding parts are capable of adjustment, so that timbers of any size may be held on different sides quite firmly, and brought up to the cutters by the traversing bed, for preparing a flat or square side thereto.

Eighthly, a machine for the same purpose, which may also be used for cutting mouldings or cornices and skirting-boards

The wood in this case is secured to a traversing table and moved forward by a chain, rack and pinion, or other convenient means. Circular cutters are made to revolve above it, which strike the required pattern on the edge of the wood as it advances.

Ninthly, another machine for the same purpose, only in this case the machinery with the cutters approaches the wood instead of the wood approaching the cutters. This consists of a movable bed traversing upon a fixed one; this bed carries the cutters with their driving wheels, &c. The wood is held upon a rising and falling table, while the machinery, cutters, &c. on the traversing bed are made to approach and perform the required operations on its surface and edges.

JOHN LAMBERT, OF COVENTRY STREET, WESTMINSTER, *for improvements in the manufacture of soap.*—Petty Bag Office, January 15, 1841.

These improvements consist in the production of a cheap paste to be advantageously employed for mixing with soap. This paste is produced in the following manner: —bones being first cleansed with sulphuric acid are to be broken into small pieces and packed closely in a suitable vessel, they are then covered with caustic alkaline ley, or leys of crystals of soda, spec. grav. 1.120 to 1.140, water being 1.000. After standing for about a fortnight or three weeks these materials will be reduced to the consistence of kitchen stuff; it is then passed between three pair of rollers, placed one above the other having suitable hoppers. One roller in each pair turns faster than its companion, which gives friction as well as pressure to any substance passing between them. After the paste has passed through these rollers it is heated by steam, and is then in a fit state for admixture with the soap; this should be done when the soap is ready for framing, the paste should be well stirred in for the purpose of thoroughly incorporating the two substances, when the soap may be framed in the usual manner.

The paste will be improved by adding 10 lbs. of tallow and 10 lbs. of alkaline ley to every 100 lbs. of paste. Should the paste be too thin it must be solidified by continuing the heat and evaporating the superabundant moisture; if too thick, it may be thinned by the addition of caustic alkaline leys. The quantity of paste used will of course depend upon the quality of soap which is desired to be produced; a common soap may be made with two thirds of paste to one third of soap.

JOSEPH BENNETT, OF TURNLEE, NEAR GLOSSOP, DERBY, COTTON SPINNER AND PAPER MAKER, *for certain improvements in machinery for cutting rags, ropes, waste, hay, straw, or other soft or fibrous substances usually subject to the operation of cutting or chopping, part of which improvements are applicable to the tearing, pulling in pieces, or opening of rags, ropes, or other tough materials.*—Rolls Chapel Office, Jan. 26, 1841.

These improvements consist in the combining of certain machinery so as to adapt them to perform the various operations enumerated in the wordy title of this patent. By means of this particular combination, a regular, uniform, and clear cut is produced, an operation (said to be) of very great importance in paper making; whereby manual labour is in a great measure superseded, the work better executed, and trouble and expense materially diminished.

The machine consists of a strong cast iron frame, about four feet square, with one di-

vision or mid-feather to support the middle bearing of the main shaft, and to which mid-feather the fixed knife for cutting, and the feeding apparatus, are attached. A strong wrought iron shaft has one fast collar on one side of the middle bearing, and three moveable ones on the same shaft; close behind each of the loose collars, the shaft has a slot cut through, and a "gibb and cottars" introduced, by which means the collars are forced up against the bearing journals, and the shaft always kept steady and prevented from moving endways, which steadiness is essential in cutting any substance when the knives have regularly to work against each other, for if the shaft has any play the cutting edges of the knives will be spoiled. A bevil wheel on the main shaft works another on a cross shaft carrying a pinion, which works a spur wheel connected with the feeder or taking in roller, by whose motion the materials to be cut are introduced to the acquaintance of the knives. A mouth-piece or plate of metal is bent round to the same circle as the taking-in roller, only placed closer on the delivering side, where there is a recess for the insertion of a steel blade or knife. This steel blade is also curved to correspond with the taking-in roller, with which it should be in close contact, so as to get a firm hold of the material close to the cut. The knife is so fixed to the mouth-piece that its cutting edge is most prominent. One end of the knife is bevilled, and fits into a dovetail in the solid metal; the other is held by a moveable plate and screw bolts, passing through the mouth-piece into the mid-feather of the frame, so that the knife can be easily taken off whenever it requires repairing or grinding. The taking-in roller is fluted, the flutes being either in straight lines, or in a spiral direction. By this fluted roller pressing against the circular mouth-piece and knife, the material introduced is carried forward and held tight close to the cut—which pressure is obtained by levers and weights connected with the roller, and pedestals or bearings in which there are sliding steps for communicating the pressure to the taking-in roller. Near the middle of the main shaft there is a knife-wheel, with two or more arms for the attachment of a suitable number of knives of any approved form. Upon the same shaft there are fast and loose pulleys for receiving motion from any convenient source, and also a fly wheel about eight feet diameter to give uniformity of motion, and thereby save power by counteracting the resistance or check of the cut. As fast as the cut material falls from the knives, it is carried away by an endless cloth running round two rollers or pulleys driven by a belt from the main shaft.

The machine for tearing, pulling to pieces, or opening rags, ropes, or other tough materials, consists of a mouth-piece and feeding roller as before described, being precisely the same both in form and principle of holding the material to be operated upon. A large cylinder full of steel or iron teeth (steel being preferred) made sharp at the points, revolves with great speed towards the feeder, to which it is brought very close, so that the rags, ropes, &c., being held firm at the edge of the mouth-piece, will be completely separated and opened [illegible] as they come in contact with the teeth of the cylinder, from whence they are combed down against the straight face of the feeder, and held by it against the action of the teeth. By this means the dirt, sand, grit, &c., get loosened and fall through a grating which passes round under the circumference of the cylinder; as the rags or other matters are carried forward over the grating they enter a box from which they pass on to the dust cylinder and feeder into which a loose "grid" is introduced to receive any deposit the materials may leave in passing over. Behind this apparatus there is a slowly revolving cylinder covered with wire grating, of a small mesh, to receive the dust out of the rags as they are discharged and thrown against it by the rapid motion of the tooth-covered cylinder. This wire-coated cylinder is closed in with a wood or iron case from the top of which there is a pipe having at its upper extremity a revolving fan to draw off the dust and convey it away from the machine. A discharger, which is an endless cloth running on rollers, travels at the same speed as the grated cylinder and receives the torn materials free from dust and dirt.

James Taaffe, of Shaw Street, Dublin, Slater and Builder, *for improvements in roofing and slating houses and other buildings.* Enrolment Office, Feb. 1, 1841.

These improvements consist of a novel mode of roofing and slating houses and other buildings, whereby much of the overlapping of the slates will be avoided, and roofs will be more advantageously formed and constructed with a much smaller quantity of timber and slates than at present used. And a roof formed according to the tenor of this patent, will, it is said, be much superior to that which could have been produced by a larger quantity of timber and slate applied as hitherto practised. In the first place, the rafters have a groove ploughed or otherwise made in their upper surface which is to be lined with lead, zinc, or other suitable metal to form water channels or courses. Two other modes of forming these water courses are shown. In the one case the rafter is divided into two and an angular metal gutter placed

between; the other is formed by nailing two projecting strips of wood along the sides of the rafter, which form the sides of the channel. The rafters being furnished with proper water channels in some of these, or other convenient ways, slates are taken of such a width as to reach exactly from the centre of one water course to the centre of the next, so that the side joinings of each series of slate fall exactly over the centre of the water channels, by which means any water that may pass through between them, is carried off into proper gutters. The first or lowest row of slates are screwed to the rafters by four copper screws, one in each corner, but in all the other rows, two screws (at the upper corners) only are used. Nails may be used instead of screws for fastening the slates to the roof, but the latter are preferred.

Where the slates overlap each other they are held together by clamps of this form, **I**, made of copper or zinc. A notch is cut in the sides of the two upper slates, and a space cleared away in the two lower ones to admit the stem of the clamp. On the under side of the slates where they overlap, two throats or grooves are cut to prevent the water from running along underneath and so getting beyond the water channels.

Thomas Barnabas Daft, of Birmingham, Gentleman, *for improvements in inkstands or inkholders.*—Enrolment Office, February 1, 1841.

These improvements are three-fold, and relate to that particular class of inkstands in which the ink is made to flow up out of a vessel or reservoir into an elevated inkholder.

The first is a modification of the inkstand previously patented by Mr. Daft, and very fully described in our 862nd Number. In that inkstand a piston was moved up and down by the action of a screw, which caused the ink to rise in the inkholder in consequence of the increased quantity of air thrown in by that movement. In the present case, instead of the screw, the piston is attached to a jointed lever, the extremity of which forms a suitable cover to the inkholder. If the cover is shut down, the piston is at the top of the air cylinder, and on raising the cover the piston will be forced down, and a supply of ink forced up into the inkholder ready for use, so that the very act of opening and shutting the cover fills and empties the inkholder.*

The second improvement consists in the employment of a flexible membrane or diaphragm instead of a packed piston in the foregoing kind of inkstands. At the bottom of the cylinder a piece of some flexible material is secured, caoutchouc being preferred, and attached to the end of the piston-rod worked by the jointed lever as before stated. When the cover of the inkstand is shut down the india rubber is drawn up into the cylinder presenting a concave surface, but on raising the lid, the piston rod descends and the india-rubber is protruded from the cylinder and presents a convex surface, a quantity of ink equal to the difference of space between these two states being forced up into the inkholder ready for use.

Thirdly, a form of inkstand acting on the same principle as the foregoing, but differently constructed, consists of a reservoir or vessel of any desired shape, with a short cylindrical neck in which a piston or plunger (cork being preferred) moves up and down by pressure; the tube of the inkholder, or ink passage, passing through such piston or plunger. On depressing the piston or plunger, the space within the inkstand becomes diminished, and the ink is constrained to flow up into the elevated inkholder; but on raising the piston, the ink again returns into the reservoir. The patentee places fine wire gauze at the bottom of the inkholder or tube, for the purpose of filtering the ink, or he contracts the orifice of the tube so as to answer the same purpose.

The claim is, 1. The mode of causing the ink to flow up out of a vessel into an inkholder above the level of the ink in the containing vessel by means of connecting the movement of the cover of the inkholder with apparatus for raising the ink as described.

2. The mode of raising the ink up into an inkholder placed in a position above the level of the ink in the inkstand by means of applying a flexible surface in the manner above described.

3. The mode of making inkstands or inkholders where the ink is caused to rise above its level, in order to offer a supply for use by passing the tube, or ink passage of the inkholder, through the piston or plunger.

James Hodgson, of Liverpool, Engineer, *for a new mode of combining and applying machinery for the purpose of cutting and planing wood, so as to produce plain or moulded surfaces.*—Enrolment Office, Feb. 3, 1841.

This invention consists in a mode of combining and applying machinery whereby the patentee is enabled to employ a rotary spiral cutter for cutting and planing wood so as to produce either plain or moulded surfaces. The machinery consists of a strong cast iron frame, of any required dimensions, planed perfectly true on its upper edges, the feet or standards being bolted down to the flooring so as to give great firmness and stability. A cast iron table, also planed perfectly true, slides smoothly and equally upon

* Advertised in our monthly advertising sheets as the Double Patent Ferryian Filter Inkstand.

the bed; this table is fitted with a cover or plate of wood on its upper surface, for the convenience of affixing thereto the wood to be operated upon by the machine.

Nearly in the middle of the bed there rises an upright frame or slide, in which the revolving spiral cutter is supported, and raised or lowered by a screw. The spiral cutter consists of a twisted bar of steel, or of iron and steel combined, the cutting edge passing from one end to the other in a spiral direction around the axis of its motion. This cutter is driven at a great speed, and revolves transversely to the grain of the wood. Such a cutter is adapted for the production of plain surfaces only; if mouldings are to be produced, the cutter must be worked out to the pattern intended to be given to the moulding. One mode of effecting this is stated to be by making a steel tool of the pattern required, which is placed beneath the spiral cutter while in rapid motion and gently raised as the cutter becomes indented. The edges of the pattern thus produced, are then filed up to an angle and sharpened, so as to make a clean cut in the wood moulding. The motion is supplied from a steam engine or other prime mover to a fast or loose pulley, from whence a series of wheels and bands communicate the necessary high velocity to the spiral cutter. The table on which the wood is fixed to be cut slides backward and forward upon the bed; a rack placed on its under side is acted upon by a pinion, driven by suitable traversing gear, and carried forward to the cutter. The backward movement is accomplished by a small handle on the axis of the pinion.

The claim is for the mode described, of combining and applying machinery so as to employ a spiral rotatory cutter for cutting and planing wood so as to produce plain or moulded surfaces.

LIST OF IRISH PATENTS GRANTED FOR DECEMBER, 1840.

J. Gibson and Thomas Muir, for improvements in cleaning silk and other [illegible] substances.

W. H. B. Webster, for improvements in preparing skins and other animal matters, for the purposes of tanning and the manufacture of gelatine.

Thomas Oram, for improvements in the manufacture of fuel.

H. Waterton, for certain improvements in the manufacture of Sal Ammoniac.

Thomas Lawes, for certain improvements in the method and process, and apparatus for cleansing and dressing feathers.

A. F. Campbell and C. White, for improvements in ploughs, and certain other agricultural implements.

R. Stirling, for certain improvements in wire ropes, and in machinery for making such ropes, which ropes are applicable to various purposes.

Thomas Kerr, Esq., for a new and improved mortar, or cement for building, also for moulding, castings, statuary, tiles, pottery, imitations of hard and soft rocks, and other useful purposes, and which mortar, or cement, is applicable as a manure for promoting vegetation and destroying noxious insects.

John Condie, for improvements in applying springs to locomotive and railway, and other carriages.

NOTES AND NOTICES.

Mr. Rennie's Trapezium Paddle Wheel.—The war ship *African* is now in the course of being fitted with paddle-wheels on this improved plan, a full description of which we gave in our 32nd volume, page 172. The Trapezium Paddle-Wheel, our readers may recollect, differs only from the common paddle-wheel in the form of its floats, which are trapezoidal or spear-shaped, and in the greater simplicity of its construction. A wheel of this form is of but one-half the breadth, one-half the weight, and one-half the surface of the common rectangular paddle wheel; while at the same time it has been proved to be equally efficient by a series of experiments on two separate steam vessels, in opposition to wheels of the ordinary construction. The advantages resulting from the diminished breadth and weight are, less space occupied in a river, basin, or lock—less surface resistance to a head wind (by all the breadth of one wheel), lighter draught of water, less oscillation sideways, and consequently less damage to the engines; and the loss of power occasioned by the oblique action of the rectangular wheels both in going into and out of the water is entirely prevented.

Stone for the New Houses of Parliament.—Charles Wright, Esq., of North Anston, has been offered after the rate of 1,500*l* per acre by Government, for the stone contained in two fields of about sixteen acres, at the above place, wanted for the erection of the new Houses of Parliament. This very liberal offer, we understand, has been rejected, notwithstanding the fields were to be re-delivered to Mr. Wright, on a sufficient quantity of stone having been obtained from them for the purpose alluded to. The land is totally unconnected with any building, and only of an ordinary description, so far as the soil is concerned.—*Sheffield Iris.*

The Home Sulphur Trade.—It is gratifying to find that the sulphur trade, or rather, we should say, the use of sulphur ores in this country continues to advance; and every inquiry we have instituted—and they have been many, both in the mining districts and of the principal consumers—confirm the opinion we have so frequently expressed—that his Volcanic Majesty, the King of the Two Sicilies, may sit down quietly, and not only make up his mind to the loss of his money in making reparation for breach of national faith, but also all the contemplated income arising from the duty imposed on the export of sulphur from his dominions. Matters, as regards the sulphur ores of England and Ireland, look cheeringly—communications have been opened with France, Holland, and Portugal, and shipments of ore already made. An eminent house in the North has entered into an engagement with one mine, in the county of Wicklow, to take, in addition to their ordinary consumption of sulphur ore, 600 tons per month of the poor copper ores, from which they extract the sulphur, and afterwards obtain the ore by a patented process, and this contract extends over a period of two years—thus comprehending nearly 15,000 tons. Other mines are under heavy contracts.—*Mining Journal.*

Thames Tunnel.—The works below have been for some time suspended, the tunnel having been completed to within the limits of the company's wharf on the Middlesex shore, far beyond the low-water mark. When the shaft is completed on the north side the excavations will be resumed; and, as there is now no fear of another irruption, the remaining portion of the tunnel can be completed

a few weeks. It is confidently expected that the tunnel will be opened for foot passengers on or before next July. The arches of the tunnel are in a sound state, and bear evidence of the care taken in the execution of this great and expensive undertaking.

Bennett's Filter.—Sir,—On the strength of a recommendation in the *Athenæum* or *Mechanics' Magazine*, I forget which, I many years since procured a filter from a person of the name of Bennett, Newton-street, Manchester. It has been in use ever since to my entire satisfaction—but was casually broken a few weeks since. I have since written two letters to the above address without receiving an answer. May I be allowed to ask through your journal where I can procure one by Bennett, or on Bennett's principle. Your obedient servant,

London, Jan. 26. H. S.

Zincing Copper and Brass.—M. Boettiger has succeeded in covering plates and wires of copper, brass, pins, &c., with a brilliant coating of zinc. His method is as follows: granulated zinc is prepared by pouring the fused metal into a heated iron mortar, and stirring it rapidly with the pestle until it is solidified. The metal thus granulated is placed in a porcelain capsule, or in some other non-metallic vessel. A saturated solution of sal-ammoniac is poured over it; the mixture is boiled; the objects to be rendered white are now placed in it, previously dipped in dilute hydrochloric acid: in a few minutes they are covered with a brilliant coating of zinc, which it is very difficult to remove by friction. The galvanic action is thus explained: the double chloride of zinc and ammonium formed is decomposed by the zinc and the plate of copper; the chlorine disengaged from the sal-ammoniac goes to the zinc; the ammonium is disengaged in the form of gas, and the undecomposed sal-ammoniac combines with the chloride of zinc to form the double chloride, a very soluble and easily decomposed salt. If then, an excess of zinc exists in the solution in contact with the electro-negative copper, the salt is decomposed into its elements, and the reduced zinc is deposited on the negative copper.—*Athenæum*.

New Shoe for Horses.—A Frenchman of the name of Jony, who is at present resident in Poland, has invented a new method of shoeing horses, for which the emperor has awarded him 50,000 roubles, besides an exclusive patent. Jony covers the entire hoof with iron, and the base of his shoe, or as it is called, sandal, is perfectly smooth. This method of his is being adopted in all parts of Russia. It requires neither nail nor screw; it is extremely cheap; and has the important characteristic of great lightness. Horses, whose hoofs have been destroyed by bad shoeing, are, by the use of these "hippo-sandals," restored in a short time to their former state efficiency, and may be used as soon as they are provided with them. Some horses have been brought to Mr. Jony's smithy, which could scarcely limp along, and with their hoofs in so lamentable a state, that the common mode of shoeing could not have been applied to them; but after performing a slight operation upon them, and putting the new sandal on their feet, they were sent back to their owners in a comparatively sound state and fit for work.—*United Service Journal.*

Caoutchouc Boat.—A Mr. Kitson has been exhibiting on the Neva, at St. Petersburgh, a caoutchouc boat. We quote the following description of it from the *United Service Journal* for this month, though we see nothing in it differing materially from the boat of the same sort which was several years ago proposed to our own Board of Admiralty by Mr. Cow, of the Dock Yard. (See *Mec. Mag.*, vol. 23, pp. 224 and 278.) "It has double sides, which are filled with air. These sides are made of sail cloth, over which caoutchouc is laid, and have neither wood or iron in any part of them. The whole boat has a length of seven feet; and may be rolled up into a very small compass. In about ten minutes' time it may be filled with air, in the course of which operation it gradually assumes the shape of a boat. In many points of view the contrivance may be of much use; it may be used over shallows and swamps, where the water is not above two inches deep, and is so shaped, that it cannot be readily upset by the waves; even when filled with water, it continues swimming on the surface. Its cheapness and great portability promise to make it part of the equipment of all sea-going vessels, and the more so, as the materials of which it is constructed are very strong and durable, as well as capable of resisting a heavy blow against hard substances. It is intended to make portable pontoons of this description.

With deep sorrow we have to record the death, on the 2nd instant, of our much esteemed friend and old and valued correspondent, Dr. Olinthus Gregory, in the 67th year of his age. Never had the cause of Popular Education and Popular Institutions a warmer friend or more zealous and untiring advocate. No man of his time laboured more assiduously or more successfully to make the abstract truths of science subservient to the practical uses of the manufacturer, engineer, and mechanic. Whatever time Dr. Gregory had to spare from the performance of his official duties as Professor of Mathematics in the Royal Military Academy at Woolwich—from which arduous and responsible situation he had retired only two or three years before his death—was devoted to the diffusion throughout the world, by means of his pen, of a knowledge of the applicate results of those branches of learning, the elements of which it was his daily office to teach; or to compositions on other subjects of a nature directly calculated to make men wiser, better, and happier. His "Mathematics for Practical Men," and "Letters on the Evidences of Christianity" may be especially cited as indicating the highly useful character of his labours, and the important services rendered by him to society.

We hope to see before long a full Memoir of the Life and Works of our lamented friend, from the pen of some of his surviving relations; for it is in that way only, adequate justice can be done to a career of such extensive and varied usefulness, and his just claim be vindicated to a foremost place amongst the benefactors of his country and of mankind.

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APPARATUS FOR PREVENTING ACCIDENTS ON RAILWAYS.

Fig. 1.

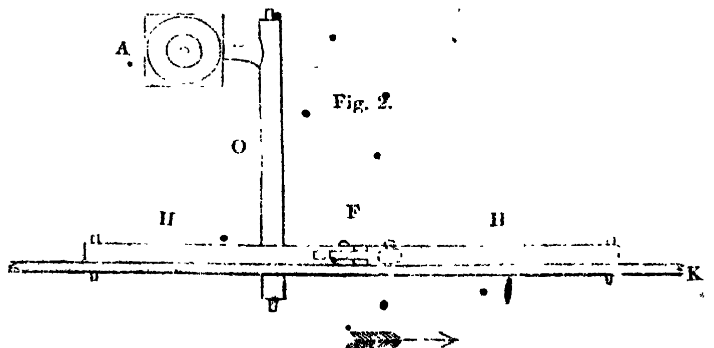


Fig. 2.

ESSAY ON THE MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES. BY SIR GEORGE CAYLEY, BART.

[Concluded from vol. xxxiii, page 566.]

The French in their imitation of the ice mounds, which form so striking a portion of the amusements of winter in Russia, were the first to use the railroad with great speed. The average velocity of the carriages on their Montagne Russe, I ascertained, in the year 1818, to be 17 miles per hour; but a part of the course was purposely retarded by remounting to a slight elevation, so that the speed was full 30 miles per hour in some part of the way.

To render these carriages secure on the rails, four small wheels were placed under a projecting part, immediately beneath those which supported the carriage; the lower wheels did not touch the under part of the rail, unless the velocity caused the upper ones to jump half an inch, or perhaps an inch, when they effectually prevented the carriage being thrown off.

In the construction of new railways, some modification of this principle might be adopted, and a middle rail, as was lately well suggested, might, by having projecting sides be made to answer this purpose. There is one danger to be apprehended, in thus, as it were, tying the carriages to the rails; so long as the machinery keeps sound, it ensures all going right; but if any part breaks, there may arise as great a shock from the wedging of the broken parts as from meeting a solid obstacle; indeed small objects on the rails might induce, by this sort of wedging, a greater injury than might arise from being thrown off the rail.

Many of these cases, like most other known affairs, admit only of a choice of evils; and experience can alone determine fully which gives the greater safety.

No means of locomotion for man has yet been devised in which fatal accidents do not occasionally occur; even his own feet have betrayed him into falls destructive of life. The horse kills his thousands annually, from the saddle, and still more perhaps from the vehicles he gives motion to. The gallant sailing vessel is lost on the sea shore; the steamer is not so caught, but as a full equivalent, adds the chance of being blown up to that being drowned. Railways must never be expected to be exempt from this common condition of the power of moving, more especially if we consider what a quantity of it is condensed into so short a space of time: a man with his horse and gig travels thirty miles a day, but on the railroad he gets over this day's work in an hour; and if he spends his day on the railroad, he will only be at par, should he meet with ten or twelve times as many accidents as might occur to his gig that day. It is satisfactory, as regards the future prospects of railway conveyance, that the greater part of the accidents that have lately occurred on the various railroads have arisen from the want of proper precautions, rather than to matters inseparable from the nature of this mode of conveyance.

It was my intention when commencing this Essay, to take a cursory view of the moral as well as mechanical means of obviating danger on railways: but the public attention is now quite sufficiently awake to the whole case; and especially, to the former part of it. The late Railway Conference cannot fail to lead to the best results. I quite agree in its opinion, that any hasty legislation on the subject would be extremely dangerous to the public and the proprietors; indeed the former must necessarily suffer with the latter, for unless the spirit of the speculation be kept brisk and lively, all attention would languish, and a sleeping agency soon bring the thing into disuse. But though it would be unwise to legislate in the present crude state of our knowledge on this subject, it would be abundantly wise to appoint a Committee of Enquiry to take down all the best evidence impartially; and to give it to the public aided by a well digested and luminous report. This could not fail to elicit such suggestions from talented and experienced individuals as would eventually lead to sound legislation.

I shall close these observations by describing a mechanical means of warning trains of the approach of danger, which, if properly carried out, will nearly ensure them from any collision with others. To do this it is, however, necessary to make it a positive law, that the up trains shall always keep to one set of rails, and the down trains to the other.

Mr. Curtis has, I find, anticipated me in applying the tension of rods or wires to transmit signals from one station post to another at a considerable distance. I shall therefore leave it in his better hands, excepting so far as respects its application to the case alluded to, which that gentleman has not noticed.

An ordinary train of thirty tons going at 22½ miles per hour, after the force of the engine is cut off, proceeds, according to the experiments of Mr. Gregory on the Croydon railway, about 380 yards before it stops; but when the steam was cut off from an assistant engine behind the train, and its break screwed down the engine stopped in less than its length. If, therefore, the drags, proposed, be placed on all the carriages of a train, it would be stopped in a few yards.

Suppose that signal posts be placed at a mile distance from each other on each side of the railroad, the one for the up, the other for the down trains;* let these posts be furnished with lamps for gas lights by night, and with red signals for both night and day work. By a contrivance which will be detailed for those who may chuse to wade through such matters, every train that comes up to one of these posts, causes its red signal to be hoisted, which continues up till the train proceeds a mile further, and has arrived at the next post, in passing which, the signal on the *first* post is withdrawn: and thus, should an accident cause the train to stop, before it reaches the *second* post, the signal for danger will be up in the face of the succeeding train, without trusting to fallible human attention.

For the purpose of obviating the possible want of attention in the conductor, more especially in the case of fogs, a *bell* should likewise be so arranged as to ring on the train passing any post showing the red signal; or, according to Mr. Rotch's plan, the steam whistle may be set in action. As soon as the conductor, by some of those means becomes aware of approaching danger, he must proceed slowly and cautiously to the point where the preceding train has stopped. The only danger that can occur with proper attention to these mechanical signals, is, when the stoppage, from accident, happens immediately after a train has passed its guardian signal post; because at night, or in a fog, the conductor of the following train might not see the signal in time to enable him to stop it completely; yet as it appears, from the experiments of Mr. Gregory, a proper application of drags, as previously noticed, will be sufficient to effect this in a few yards, the risk, therefore, is very slight; and even this risk may be still further diminished, if every train, as it undoubtedly ought to be, were furnished with an alarm bell, to be rung, by one of the officials from the time of any accident, till all be right again.†

A round rod of iron a quarter of an inch thick, and one mile in length will weigh about 850 lbs., and is qualified to exert a tension without injury, of more than 1000 lbs.: if supported on small pulleys or rollers, every six feet, the friction in moving it for a few inches, which is all that is required for the intended purpose, will amount to a mere trifle; any tension therefore within the limits of 1000 lbs. may thus be commanded between posts one mile asunder. Let A. Fig. 1, be a gas lamp, showing the ordinary white light, and B, a pane of transparent red glass of the full size of the side of the lamp, set in a frame which is connected with a sliding rod, passing down the hollow shaft of the column which supports the lamp: this frame, and part of the adjacent glass, is painted bright red, for a day signal, but is so mastered by the shade C in front of it, that it cannot be seen till lifted up, so as to correspond in position with the plate of clear glass forming the side of the lamp which it then covers, and exhibits the red signal both by night and day. The rod supporting this red frame passes down below the lamp post, and the termination of it is furnished with a flat plate, which rests on the circular end of the beam D, which beam turns freely on an axis in its centre, so that when depressed at one end, the other is elevated, and by this means the rod and its signal are lifted when required. On this rod there is a projecting tooth which receives a catch by a weight or spring E, so that when the signal is hoisted, it cannot come down till this catch be liberated, when it instantly descends till the plate at

* One set of posts in the middle might do for both.

† A hand bell of good size would be most likely to be ready, in the event of the engine being upset, and ought to be kept in some conspicuous place in addition to the fixed one.

the end again rests on the circular projecting post of the lifting beam to be ready for the next occasion. The opposite end of the beam is connected with an upright rod F, which at its lower end rests on a spring G, and has its upper end jointed into one of the two oblique moveable bars H, H. These bars when forcibly pressed down, can become horizontal; the ends being, in order to effect this purpose, jointed in connection with the railway bars K, K, Figs. 1 and 2, and their point of union connected by a bolt working in a groove of sufficient length to permit the free action of these bars, from an oblique to a horizontal position.

It is evident, from this construction, that, if a carriage passing along the rail, has a small projecting wheel so fixed as to roll over these bars at the level of their hinges, they must bring them gradually into a horizontal position, and thus compress the spring G, and by the beam D, elevate the signal B.

When the carriage has passed the beam D, the connected bars H H, return to their former position; but the catch connected with the weight E, retains the signal in its place, until the carriage arrives at the next signal lamp, when, by communicating a strong tension to the mile of wire, passing over the pullies M M, the catch is liberated, and the signal falls behind its mask; thus showing that that mile of railway is clear for the next train. The pull which liberates the catch is communicated at the signal post in advance by an apparatus, similar to what is here shown, as connected with the one a mile in the rear.

From the top of an upright arm in the beam D proceeds a strong cord, passing over two pullies and under a third at N. When it has passed the third pulley it is made fast to the wire L, and thus connected with the signal-lamp in the rear; by this means the same movement which elevates the signal at this post, withdraws it at the other. This part of the apparatus is rendered more complicated in appearance by its being necessary to compensate for the expansion and contraction of a mile of wire, which, in this climate, may have a range of about 40 inches. The vessel at N is filled with tar, or any viscid fluid that does not readily freeze; the middle pulley is placed on the top of a piston-rod, the piston of which fits, though not quite so as to touch, the cylinder holding the tar; by this arrangement the piston, which must be duly weighted to suit the purpose, if it do not overpower the catch, slowly accommodates itself to the expansion or contraction of the wire; but powerfully resists, by atmospheric pressure, the sudden pull of the arm of the beam D, so as to transfer it to the distant signal, as required. Many other methods might be shown for producing these effects, which are in fact of the most ordinary class of mechanical movements: I have arranged these more to point out the facility with which so desirable an object may be accomplished, than as the best means of executing the work.

It is necessary further to remark that the position of the lamp A with respect to the rails, is shown on the ground plan of fig. 2; hence, several of the arms shown in profile as contiguous in fig. 1, are not, as there represented, in the same plane, but are placed at the further extremity of a long axis, as seen at fig. 2, which does not affect the efficiency of their mutual action, as already described.

Although the machinery has here been confined to the size of an ordinary lamp, there is no reason why the whole of it, especially the signal part, may not be made of any required magnitude.

If a train pass a lamp when the signal is up, a bell attached to the post ought to be rung, or the steam whistle of the engine opened by some simple contrivance brought into gear or withdrawn by the movements of the rod supporting the signal, which any engineer will readily accomplish.

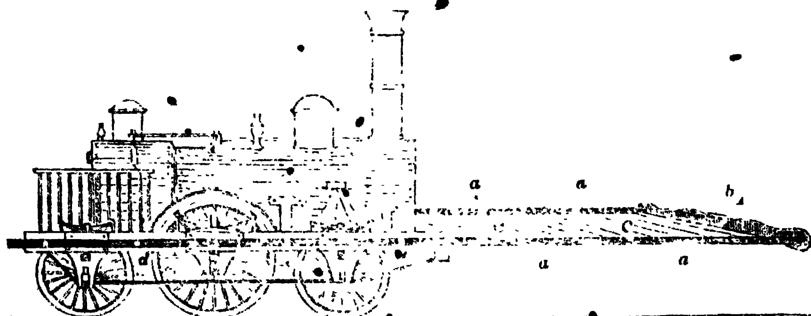
The mechanical arrangement of the points, by which trains are turned off from one set of rails to another, is complete enough when properly applied, but the conductor of a train must wholly trust for that application to another—he has no means of perceiving whether all is right or not. This is a fault that ought to be rectified, which might readily be done by connecting the movement of the points, from an arm attached to them under ground, with some visible signal at the side of the road, so that the conductor may become fully aware how they are placed before he comes up to them.

Hitherto the means of safety for trains, as a whole, have been considered;

but as the officers on whose conduct depends the security of all the rest, proceeds with the engine in front, it may not be thought unfair to let these take a somewhat greater share in the danger, especially if in so doing we materially diminish that of all the others. The engine would pull the train with equal efficiency if a rope of fifty yards intervened; as is practically seen in the case of horses towing barges with a great length of rope; by this means if any accident stopped the engine there would be sufficient space for the train to be stopped by the drags before it came up with the engine. Should this arrangement be adopted it would be necessary to have an officer at the head of the train in addition to those with the engine, for the purpose of working the voluntary drags, if they may be so termed, and regulating the speed on inclined falls of the rail-road; but these must be so constructed as also to act mechanically on the occasion of the engine being stopped, and not trust to human attention on so momentary and usually unexpected a contingency. As these voluntary drags turn freely on an axis, let us suppose that whenever the train is at rest they are brought by a slight spring or weight just up to the point where their action would commence, by the wheels getting upon them, so that if the train were moved forward they would act. If the rope from the engine be made fast to a lever so connected with the spring which brings the drags into play; that as long as the engine continues to pull, the action of the spring is overcome, they will not impede the progress of the train; but if the engine stops, the drags are instantly at work. The officer at the head of the train may make a voluntary use of these drags at any time, by means of a lever with which he intercepts the tug of the engine from bearing upon the springs; and he should have the command of a break for the purpose of regulating the speed. He may also be provided with a stop-bolt or catch, to prevent the drags acting when inconvenient.*

I cannot conclude this essay upon some of the leading mechanical desiderata for promoting safety on rail-roads without expressing an earnest hope that this noble, most useful, and delightful invention—which gives to man a so much wider scope of action, and must, therefore, proportionately accelerate his civilization and improvement—will obtain the most serious attention, and cautious support of an enlightened legislature; and that rail-road conveyance may thus soon be ripened into a security which at present is so lamentably wanting.

ON PREVENTING INJURY FROM THE COLLISION OF RAILWAY TRAINS.



Sir,—A suggestion, although preceded by five hundred, may be permitted upon the subject of railway accidents. The above simple apparatus, which may

* As it would not be convenient that every momentary variation in the tension of the engine should bring the drags to act, some given time must be allowed to intervene between the one ceasing and the other commencing to act, say that in which the train would proceed ten yards. This may be regulated to any extent, if no better means be devised, by making the springs draw up a small piston working against atmospheric pressure (under oil which can only pass the piston at a given speed through an aperture properly regulated by a stop-cock) before they can bring the drags to work. One piston a foot in diameter and making a foot stroke, placed in the leading carriage, will be sufficient for the whole train; and it requires no nicety in its construction; hammered sheet iron even may be used for the cylinder in which it works.

be called a "Frame Buffer," appears to me adapted to prevent the formidable effects of collision.

On each side of the engine is a strong horizontal iron bar *a a*, sliding in sockets by which it is attached to the engine-frame. Each bar is 12 or 14 feet longer than the engine, projecting that distance beyond it, in front. The bars are parallel, and terminated in a strong cross piece of timber *b*, padded on the outside. The space thus enclosed before the engine is occupied by a series of ropes or wires *c c*, crossing direct from bar to bar. The sockets contain springs allowing the ropes or wires, when broken, to pass with the bars.

This machine, attached to the engine, would receive, in the event of a collision, the first blow; and the engine itself, before reaching the opposing object, would have to break through all the transverse ropes or wires in succession; thereby gradually, but effectually dissipating its force. If the engine be travelling with a momentum of 35 tons, 35 ropes or wires, each requiring a ton to break it, will exhaust the whole of this momentum, and barely permit the engine to come in contact with the object.

1. The machine admits of an exact adaptation and correspondence between the force to be deadened and the medium applied for that purpose.

2. It allows the *whole space* it occupies in front of the engine, to be traversed by the engine in stopping. In this respect it obviously excels any assemblage of springs, and the air-tube and piston contrivances, which allow only half the space they occupy for the retardation required. Those media are elastic, and elasticity is here out of place. On the accidental collision of trains, it is of the very least consequence, whether the interposed medium recovers its form—the sole object being to deaden the blow.

3. It is not applicable to the engine alone; the front carriage also, and in a long train every eighth or tenth carriage may be furnished with a frame; thus effectually protecting the front carriages from the accumulated pressure of the whole train.

4. The expense is trivial; and in point of weight the whole apparatus will scarcely add a ton to the 12 or 13 tons of the engine.

It may be objected that the frame could hardly be made strong enough. But the frame, be it observed, strikes only with the force of *its own weight;* and is struck by the weight of the engine *a ton only at a time*—receiving through the ropes or wires a series of blows of a ton each.

It has been objected that the projecting part of the frame would destroy the balance of the engine. It is difficult to see how this could happen. The projecting *half* of the frame could not tilt the *other* half *plus* the weight of the engine.

The clumsy appearance of the thing has also been objected to. This may be obviated; though it is scarcely for Directors to object to save the lives entrusted to their care, after a clumsy fashion, until they can devise a better; it is for the saved alone to make the objection. Passengers should be allowed their option, and separate trains provided. Some may prefer to be elegantly pulverised; others to be inelegantly preserved. If their wishes are to be gratified who voluntarily incur a smashing to atoms, in devotion to science—as an experimental proof of the atomic theory—equal civility is due to those who fancy the article of self-preservation. And the latter have a right to complain, that of the many plans proposed, none have yet been adopted; not so much a a surgeon, or a bottle of brandy and salt, attached to each train!

Sir, your obedient servant,

J. S. K.

January 7, 1841.

MATHEMATICAL EXERCISES.

Sir,—The following question has been sent me from two different quarters for solution. It was first, I believe, given among the Cambridge problems, but whether that be the case or not, it is, without doubt, an excellent exercise in equations, and I trust some of your mathematical contributors will give a good solution of it.

"The revenue of a state was increased, for a war in the ratio of $2\frac{1}{4} : 1$, and after deducting the expence of collecting, and the interest of the national debt, the available income was augmented in the ratio of $3\frac{12}{23} : 1$. Now it was found

upon calculation, that had the circumstances of the country permitted the revenue to be reduced in the ratio of $1\frac{7}{9} : 1$, the sum remaining after the specified deductions would have been diminished in the ratio of $7\frac{2}{3} : 1$; and would have, in fact, amounted to four millions. Required the amount of the revenue, and the interest of the debt—supposing the expence of collecting to vary as the square root of the amount collected."

The following geometrical theorem is new as far as I am aware of:

"If any two chords, A B. C D, in a circle, intersect one another in E; join A D, B C, and through E draw any third chord F E G, intersecting A D, B C, in H and K. The following analogy will always hold good: viz. F H . H G : G K . K F : : H E²: E K². Demonstrate the truth of this."

KINCLAVEN.

February 6, 1841.

P. S. I beg leave to state in answer to Nautilus's last communication, that if he, or any other of the mathematical contributors of the *Mechanics' Magazine* can demonstrate the truth of his proposition (see No. 911, p. 53,) in accordance with the required limitations, then the whole theory of parallel lines will be placed upon as sound a foundation as any of the other subjects treated of in the Elements of Euclid.

K.

SOLUTION OF "ION'S" 1ST MATHEMATICAL QUESTION. BY MR. GEO. SCOTT. (SEE "MEC. MAG.," MAY 2.)

Given, A C = 50 = a A B D = 112 = b, A C B = 118 . . 40 A D B = 70 . . 10, C A D = 54 . . 22, to find A B.

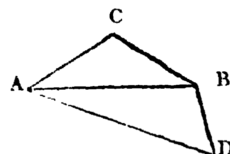
Solution: 360°—(118 . . 40 + 70 . . 10 + 54 . . 22) = 116 . . 48 = 2 S = C B D. Assume, A B D = S + x ∴ A B C = S ∓ x. Then, A B : a : : sin. C : sin. (S ∓ x) ∴

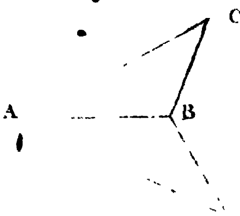
$$A\,B = \frac{\sin.\ C\ .\ a}{\sin.\ (S \mp x)};$$ similarly, $$A\,B = \frac{\sin.\ D\ .\ b}{\sin.\ (S \pm x)};$$ hence, $$\frac{\sin.\ (S \mp x)}{\sin.\ (S \pm x)} = \frac{\sin.\ D\ .\ b}{\sin.\ C\ .\ a} = P,$$ or

$$\frac{\sin.\ S\ .\ \cos.\ x \mp \cos.\ S\ .\ \sin.\ x}{\sin.\ S\ .\ \cos.\ x \pm \cos.\ S\ .\ \sin.\ x} = P,$$ or

$$\frac{1 \mp \cot.\ S\ .\ \tan.\ x}{1 \pm \cot.\ S\ .\ \tan.\ x} = P;$$ hence, $\pm$ cot. S tan. x $\pm$ cot. S tan. x . P = P—1 . If P, or $\frac{\sin.\ (S \mp x)}{\sin.\ (S \pm x)}$ be greater than 1 and S, less than 90°; then, A B D will be greater than A B C—that is, A B D = S + x, and A B C = S—x; then $$\tan.\ x = \frac{P-1}{\cot.\ S\ (P+1)} = \frac{\tan.\ S\ (P-1)}{P+1};$$ but if P, or $\frac{\sin.\ (S \pm x)}{\sin.\ (S \mp x)}$ is less than 1, then $\tan\ x = \frac{\tan.\ S\ (1-P)}{1+P}$, in which case, A B D = S — x, and A B C = S + x. When C B D is a re-entering angle as in fig. 2, then S is greater than 90, in which case P, or $\frac{\sin.\ (S+x)}{\sin.\ (S-x)}$ will be evidently less than 1, and $\frac{\sin.\ (S-x)}{\sin.\ (S+x)}$ greater than 1—that is, if P is greater or less than 1, when A B D will be less or greater than A B C.

D = 70° . . 10′	sin.		9·973443
C = 118 . . 40	cosec.		0·056790
$\frac{b}{a}$ = 2 . 24	log.. .		0·350248
P = 2 . 4015	log.. .		0·380481
P—1 = 1 . 4015	log.. .		0·146593
S = 58 . . 24′	tan.. .		10·210981
			10·357574
P+1	3 . 2015	log.. .	0·531670
x = 33° . . 48′ . . 42′	tan.. .		9.825904





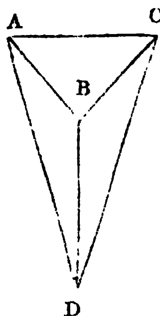
Hence, $ABD = 92° .. 12' .. 42''$, and $ABC = 24° .. 35' .. 18''$

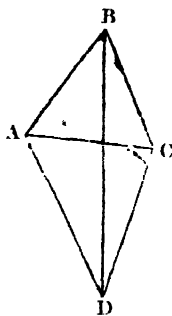
$ABD = 92° .. 12' .. 42''$	cosec.	0.000324
$ADB = 70 .. 10 .. 0$	sin..	9.973443
$AD = 112$	log..	2.049218
$AB = 105.435$	log...	2.022985

The above solution is in accordance with the request of the ingenious proposer. Had it been solved by the common rules of trigonometry the calculation would have been longer than the above in the ratio of 20 to 13.

The above mode of solution will apply to the following well known and celebrated trigonometrical problem.

Given the distances between three objects A B C, and the angles contained by lines drawn from each of them to a certain station D in the same plane with them, to determine A D, B D, C D.





1st, From the three given sides A B, A C, B C, find the $\angle$ A B C, then the sum of the two angles B A D, B C D is given.

2nd, Assume, $BAD + BCD = 2S$; also, $BAD = S \pm x$. $\therefore BCD = S \mp x$. Then, proceeding exactly as above, the $\angle$ S, B A D, and B C D, are found, and $\therefore$ A D, B D, C D, become known.

PLAN FOR REMOVING AND PREVENTING FOGS IN CITIES AND TOWNS.

Sir,—So many wonderful inventions for diminishing the difficulties incident to artificial life have been made within the last fifty years, that surely no danger can now be apprehended of a plan being rejected as impracticable merely on account of its novelty. After so many things have been denounced as wild and visionary, which have afterwards succeeded in practice, and been universally adopted, we may fairly expect, I think, that less difficulty will be experienced in obtaining a fair and impartial examination, and greater care observed in judging, of the merits of a plan now than formerly. With these expectations the following scheme for "removing fogs is humbly submitted to the readers of the *Mechanics' Magazine*. If it can be proved impracticable, at once consign it to oblivion; if the contrary, apply it for the public good; the right to the invention is freely given up.

The following facts constitute the foundation of the plan:

1st, A fog is composed of watery vapour and carbonaceous matter, or smoke.

2d, All fogs are limited both in height or depth, and in extent of surface,—when the streets of London are filled with a fog so dense, that a person cannot see a yard before him, if we ascend the monument, St. Paul's, or any other considerable eminence, all will be clear above, and the sun will, perhaps, be observed to shine with his usual splendour. Again, if we go a few miles from town and ascend a hill, the whole country beyond it will be clear and serene, whilst, if we look towards the city, it will appear one mass of smoke beneath our feet, and with here and there the top of some prominent edifice standing out from the fog like a rock from the sea. Sometimes the fog is limited to a few of the lowest parts of the town, as, for instance, Farringdon-street, and New Bridge-street, Blackfriars, when, at the same time, the higher parts surrounding, as the top of Fleet-street, Holborn Hill, Ludgate Hill, St. Paul's Church Yard, Newgate-street, &c. are perfectly clear.

3rd, The vapour, or steam, of a low-pressure steam-engine, after having driven the piston, is condensed, or converted into a liquid form, and carried away by causing it to meet a shower of cold water in a separate vessel, called the "condenser."

4th, If carbonaceous vapour, or smoke, be driven through cold water, it will be absorbed and held in solution, which may be proved in the following simple manner: take a pair of common blowing bellows, plug up the end of the pipe, and hold the valve over the thick smoke of a common coal fire; then raise the handle, and fil the bellows; if the end of the pipe be then placed a few inches under

the surface of a vessel of cold water, and the smoke discharged, it will be condensed, mingled with the water, and may thus be thrown into the common sewer.

I have sometimes noticed that when the heaviest fogs have prevailed, a shower of rain has condensed the watery vapour, mixed with the smoke, which together constitute the mist and carried them to the earth; and the atmosphere has thus been purified in a few hours.

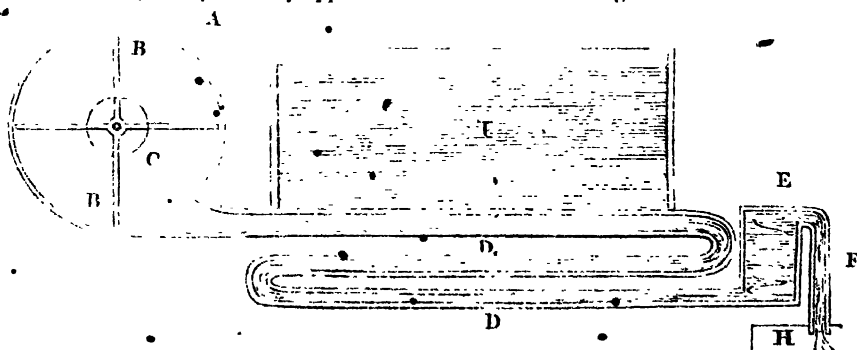
I remember that a few years ago a large cotton mill was erected on the banks of the river Mersey, in Stockport, near Manchester, the chimney of which was built upon a rock, I should think at the distance of more than one hundred yards from the furnaces; the communication between which was by means of an horizontal tunnel. Through this tunnel, which was underground, a stream of water was constantly running from some springs in the neighbourhood, and found an exit through a small aperture made for the purpose, into the river. When the fires, which were very large, being for a pair of engines of about a hundred horse power, were kindled, the smoke, in passing through the tunnel to the chimney, was partly absorbed and carried into the river by the stream of water running within, and instead of immense volumes of dense black smoke issuing from the orifice of the chimney, as was expected, a comparatively small amount of light vapour only appeared.

(Will not this serve as a hint to enable us to consume the smoke of furnaces generally?)

5th, It is a fact established by mechanical experience, that if a series of vanes be fixed to an axis and caused to revolve rapidly, a current of air, or other surrounding medium, will rush to the centre, and fly off with great velocity from the circumference.

According to the first fact, fogs consist of the vapour of water and carbonaceous matter, or smoke; according to the third and fourth facts, both these substances can be condensed and carried away by passing them through a shower of cold water; by the fifth fact, if a number of vanes, or leaves, be fixed to an axis, and made to revolve in a medium, two currents will be produced, one rushing to the centre, and the other from the circumference; and by the second fact, all fogs are limited, so that if the substance of any fog can be drawn in any degree into the current tending to the centre, and driven from the circumference, through a shower of cold water, thus condensed and carried off, it must in time be destroyed, the atmosphere rendered clear, and the hindrance to business as well as the danger to human life be removed. That this is a most desirable object to be accomplished will, no doubt, be universally admitted.

The following is a drawing of a machine for effecting this end.



A, represents a cylinder either of wood or metal about 10 feet diameter, with four vanes, B, fixed to the axis or centre C.

D D, pipes about 30 feet long, proceeding from the cylinder A.

E, a small cistern filled with water.

F, a pipe leading from the cistern E, to the sewer, or other outlet, H.

I, a large cistern attached to the pipe D, the bottom of which is pierced full of fine holes.

Mode of Working.

Suppose one of these machines to be placed in a proper locality, say in one of the lowest situations. If then the vanes are caused to revolve with great velocity (by an engine of any kind, or by manual labour), the surrounding fog will rush in at the centre C, from whence it will be driven through the pipe D, where meeting with a shower of cold water from the cistern I, it will be condensed, and rushing through the series of pipes and the small cistern E, every particle of foggy matter will be absorbed, and carried through the pipe F, into the common sewer H. A few of these machines kept constantly at work during foggy weather, would very soon clear the atmosphere from every impurity.

Seeing that a shower of rain will disperse a fog, by condensing and carrying it down to the earth, would not a few water or fire engines playing, with a rose placed at the end of their discharging pipes, so as to produce a shower, be serviceable in diminishing a fog? At all events there can be no harm in trying such an experiment.

I am, Sir, yours respectfully,

S. Rowbotham.

ON THE ADVANTAGES OF WORKING STEAM EXPANSIVELY — URWIN'S IMPROVEMENTS IN STEAM-ENGINES QUESTIONED.

Sir,—It is at all times an ungracious task to express an adverse opinion upon the works of another, but I hope I shall be pardoned for presuming to do so regarding Mr. Urwin's engine, described in your last number, having devoted much time to the consideration of the expansive principle.

The advantage of working steam expansively is, perhaps, rendered far more palpable and glaring on a superficial view of Mr. Urwin's engine, than by the more solid and profitable mode commonly adopted of effecting the object wholly within the cylinder; therefore it is better calculated to make an impression on the public mind, and will, I hope and trust, have the effect in some measure of drawing attention more generally and more closely to this vastly important question, towards which a most extraordinary degree of apathy still exists, notwithstanding all that has been done and written in its favour.

The engine in question is an expansive engine in every sense of the term, and, notwithstanding any ingenuity the invention may display, it will be found upon due investigation that the principle adopted is very defective—the complicated* addition to the steam cylinder being not only highly inexpedient but injurious, as a large proportion of the power obtained by the common mode is absolutely sacrificed by the arrangement, which I will now endeavour to explain.

Supposing steam of forty pounds pressure to be cut off at half stroke, the remainder of the stroke will of course be completed purely by the inherent power of expansion possessed by the steam enclosed, which, commencing at forty, terminates at a pressure of twenty pounds, when it occupies a space just double its original volume, and has exerted a mean force of thirty pounds per inch for the last half stroke, equal to thirty five pounds during the whole stroke.

It must be observed that the steam as applied to the piston of the new engine is analogous to this; inasmuch as it can be only regarded as expanding to a double volume during the time it is acting against the piston—first, by driving the piston while flowing with its original pressure from the boiler throughout the down stroke, and next accomplishing the return or up stroke purely by the expansion—not of the whole volume, it is true, as in the former case, because of the waste occasioned by the transfer, but of a portion only—consequently, much of the power as obtained by the old mode is sacrificed by the new. For on the completion of the return stroke, the steam has been expanded, not only to double its original volume, but absolutely to $3\frac{1}{2}$ times that bulk, and of course, its expansive force is diminished in the same ratio. Thus, on the steam flowing into the expanding chamber of $1\frac{1}{2}$ times the size of the cylinder, it occupies both it and the cylinder, whereby the pressure is reduced from 40 to 16 pounds per inch: and when the bottom port is closed, that portion which the cylinder contains is discharged into the condenser, and therefore, no after benefit whatever is derived from its expansive

* Certainly not "complicated"; for nothing can be simpler than the construction of this engine, whatever its merits in other respects may be. Ed. M. M.

action, which is totally lost: hence, the operation of returning the piston commences with a pressure of only 16 pounds, instead of 40 as in the former case, and with a charge of steam too *inclosed in the expansive chamber*, which amounts beside to ⅔ths only of the original steam received from the boiler; consequently, the stroke is terminated by a pressure of less than ten pounds, as the steam then occupies a space equal to 2½ cylinders, and the mean effective force by which the piston is so returned, is only 13 pounds per inch, and 26 pounds is the mean for the complete stroke or revolution of the crank.

Therefore, the account will stand thus: The mean effective force obtained by the common mode if cut off at half stroke, which is using exactly the same quantity of steam as the new engine for each revolution of the crank, is, as before stated, 35 pounds (without having recourse to logarithmatical accuracy,) and by the new mode, only 26 pounds per inch. From this it will be seen, that a loss must accrue in the new engine, even on comparing it with the effect produced by the small amount of only two expansions of about 35 per cent., the difference of the sums being as 26 to 35. And as the comparative value of the steam, if expanded six times, would be 55, the loss in that case would be upwards of 50 per cent.

The chief object of this paper, however humble the effort, is to endeavour to impress the public with the vast benefit to be derived from adopting the expansive principle to the "full extent"; by which the power may be really doubled, or, in other words, the present consumption of fuel reduced one-half at least. Not only beneficial as regards present commercial enterprise, but also in husbanding and preserving the store of an invaluable mineral (which can never be renewed) to the latest possible period of time. For as Dr. Buckland has recently very justly observed, "the supply of coals, however abundant, must at some future period have an end, and with its termination will close our prosperity as a nation and our comforts as individuals." I remain, Sir,

Yours, most respectfully,

ALPHA.

Limehouse, Feb. 1, 1841.

[We shall be glad to hear from Mr. Urwin in reply to the above. ED. M.M.]

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

FRANCIS TODD, OF PENDENNIS CASTLE, FALMOUTH, GENTLEMAN, *for improvements in obtaining silver from ores and other matters containing it.* Enrolment Office, Jan. 27, 1841.

In the present ordinary mode of conducting the process of extracting silver from ores, they are melted in a reverberatory or other furnace; when melted, the furnace is tapped and the fluid metal run out into tanks of water. When cooled, the metal is collected, returned into the furnace and re-melted, when a proper quantity of lead is added to it in aid of the subsequent process of separation. In consequence of the very high temperature of the furnace employed to effect the fusion of the silver, a very large portion of the lead is destroyed and lost, and to obviate this waste is the object of the improvements constituting this patent.

The new mode is as follows:—the silver ores or other matters are melted in the usual manner, but instead of being run off into water, a bath of melted lead is provided, into which the melted mass of ores, &c. are run in thin shallow streams so as to bring as large a surface as possible in contact with the lead. The quantities recommended to be employed are thirty tons of lead to one ton of the ores: the tapping of the furnace is to be so regulated as only to run about three hundred weight of ore into one lead bath.

The claim is, for the mode of obtaining silver from ores and other substances containing it, by treating it in a melted state by running it into a lead bath or baths.

JOHN SWAIN WORTH, OF MANCHESTER, MERCHANT, *for improvements in cutting vegetable substances.* Enrolment Office, January 29, 1841.

Hay, straw, clover, or other vegetable substances are cut into small pieces by passing them between two rollers, or rather between a cutter and a roller, placed vertically over each other; the bottom roller, called the "surface roller," is composed of cast iron, covered with zinc, block-tin, wood or other moderately-hard substance; or, it may be composed entirely of wood. The upper, or "cutting roller," has a number of grooves on its circumference, into which knives or cutters are inserted; the distance of these knives from each other regulates the length of the pieces into which any substance passing between the rollers will be cut. A rapid rotary motion is given to the cutting roller, while a slower motion is communicated to the surface roller, and the hay, straw, or other vegetable substances passing through are cut into pieces of the size required.

The advantages claimed for this apparatus are, that the vegetable substances being passed over a solid substance, and a rotary

motion communicated to the cutting roller, a larger quantity will be cut, and with less labour than heretofore. We strongly suspect there is a very considerable mistake about this matter, and that if the vegetable substances are divided at all—which they may be at first, while the knives are sharp and the machine in prime order—they will be separated by something between a *jam* and a *tear*—there can be no *cut* produced by such means.

The claim is for the combination of parts for cutting vegetable substances, as described. The patentee does not claim any of the parts separately, nor this precise arrangement, as it may be varied, provided the mode of cutting set forth is retained.

ALEXANDER ANGUS CROLL, SUPERINTENDENT OF THE GAS-LIGHT AND COKE COMPANY'S WORKS, BRICK-LANE, MIDDLESEX, *for certain improvements in the manufacture of gas for the purpose of illumination, and for the preparation or manufacture of materials to be used in the purification of gas for the purpose of illumination.* Petty Bag Office, January 29, 1841.

These improvements are three-fold, and consist in the first place, in the purification of gas from ammonia, by means of salts, acids, and oxides; secondly, in re-forming or re-producing all the salts, by double decomposition with common salt; thirdly, in the application of the black oxide of manganese to purifying of coal gas from sulphuretted hydrogen.

Coal gas is purified from ammonia in the following manner. A vessel, such as is now used for holding lime for purifying gas, is filled with a solution of 1 cwt. of chloride of manganese in 40 gallons of water. The gas is made to pass through this solution by pressure from the retorts in the usual way, when the ammonia and a portion of its sulphuretted hydrogen are abstracted; the remaining portion of the sulphuretted hydrogen is abstracted by the process hereafter described, or by the usual methods. When this solution is saturated with ammonia, which may be known by the application of the usual tests, it is to be drawn off, and the vessel recharged with a fresh solution. Sulphuric or muriatic acid may be used for the same purpose; if the former is employed, a vessel, such as is now used for washing gas, is filled with a mixture of 100 gallons of water to 2¼ pounds of sulphuric acid (spec. grav. 1.845) and the gas passed through it until its spec. grav. becomes 1.170, and on testing, it is found to be saturated with ammonia. Muriatic acid (spec. grav. 1.165) may be used in the same proportion as the sulphuric, and is to be drawn off on attaining 1.170. The patentee prefers to use sulphuric acid, but sulphate of manganese and muriate of iron may also be used for these purposes.

In order to obtain the ammoniacal salts, when a salt has been used for purifying, let the solution settle, and draw off the clear liquor, which consists of muriate of ammonia and sulphate of sodium; these must be separated by crystallising the ammonia or by evaporating, the compound to dryness and then subliming the ammonia from the salts of sodium. If an acid has been used, to evaporate the ammonia is all that is necessary. The salts formed by using the chloride of manganese, and the salts of zinc, can be re-produced in like manner.

In order to free coal gas from sulphuretted hydrogen, a vessel, such as is used for purifying gas by the dry lime process, is charged with black oxide of manganese moistened with water, and the gas forced through it, exactly as in the dry lime process. As soon as the manganese becomes saturated with sulphuretted hydrogen, it is put into an oven and roasted, to expel the sulphur until it is soft and spongy, when it may be again returned to the purifier and used as before.

The process of manufacturing or re-producing the salts, by double decomposition, and the residuum and precipitates of chloride of manganese, is conducted as follows:—

Twelve ounces of dry precipitate are intimately mixed with a pound of common salt, and placed in a suitable furnace heated to an invisible redness, for two or three hours. To 140 lbs. of this mixture add 40 gallons of water, and it is then ready for purifying gas from ammonia. The insoluble part of the solution before mentioned may be brought back to its original state by dissolving it in the acid forming one of its bases, or by dissolving it in sulphuric or muriatic acid, if a sulphate or muriate of ammonia should be required.

The claim is, 1. For the purification of coal gas from ammonia, by means of the chloride and sulphate of manganese and muriate of iron, and sulphuric and muriatic acid; and the purification of coal gas from sulphuretted hydrogen by the oxide of manganese.

2. The oxide of iron and the oxide of zinc, as applied in the particular manner and stage of the manufacture of gas before mentioned, and not otherwise; also the manufacturing or re-producing of all the salts by double decomposition.

JOHN LOUIS BACHELARD, OF ST. MARTIN'S-LANE, IN THE COUNTY OF MIDDLESEX, GENTLEMAN, *for improvements in the manufacture of beds, mattrasses, chairs, sofas, cushions, pads, and other articles of a similar nature.* Enrolment Office, Jan. 30, 1841.

This invention, which is a communication from a foreigner residing abroad, consists in the employment of cork in the state of saw-dust, or threads, either alone or combined with horse-hair, wool, or other like substances for stuffing beds, mattrasses, chairs, cushions, &c. The saw-dust may be either fine or coarse, and the threads or fibres of cork are recommended to be from half an inch, to two inches or upwards in length, the thirteenth of an inch thick, and from one-eighth to one-twentieth of an inch wide. Cork having been reduced to one of these states, the workman proceeds in precisely the same manner as when using horse-hair, wool, &c., and the patentee states, that a mixture of horse-hair or wool with the cork will be found highly advantageous. The fine particles of cork forming a substratum, and being covered with a slight covering of horse-hair or wool, will give all the smoothness of a mattress stuffed with the latter substances in combination with the lightness, elasticity, and cheapness of cork. Whatever advantages may appertain to beds, cushions, &c. stuffed in this manner, for use on land, the advantages of their employment at sea must be tenfold, inasmuch, as every such article after being useful in its appointed office, in the hour of danger would constitute one very convenient and efficient *life preserver*. The patentee does not claim the use of cork generally for stuffing articles, but only when cut into fibres as above described, and applied to the manufacture of beds, chairs, sofas, cushions, &c.

GEORGE EDWARD NOONE, HIGH HOLBORN, ENGINEER, *for improvements in pumps, and in engines for drawing beer, cider, and other fluids.* Rolls Chapel Office, Feb. 3, 1841.

These improvements consist, firstly, in the application of a semi-rotary stuffing-box to pumps or engines for drawing beer, &c.

Secondly, a kind of flexible joint to be substituted for stuffing-boxes in the foregoing engines.

Thirdly, a peculiar application of flexible materials to answer the purpose of stuffing-boxes when rectilinear motion is used.

Fourthly, a mode of constructing the lower part of the pumps of beer or other engines, by which access may be readily obtained in case of need; and

Lastly, a mode of regulating the rectilinear action of the piston-rod with a guide for such purpose capable of easy adjustment.

The first of these, the semi-rotary stuffing-box, is composed of a circular apparatus or joint, working in an axis placed on the outside of the pump-barrel; on the inside of the barrel a metal plate or plates are screwed, enclosing some suitable material (either flexible or otherwise) to form the packing. The working lever is in two parts; the handle end is forked, while the piston-rod end terminates in a screw which connects it to a small wheel to which both that and the handle is firmly pinned. The space left in the box containing the connecting-wheel is filled up within by any ordinary packing material in the manner shown. In another arrangement, the metal plates and packing of the semi-rotary stuffing-box is placed on the outside of the working barrel, which arrangement is preferred for large pumps. Another modified form of joint consists in the introduction of a portion of flexible material or diaphragm, between the joint where the levers are screwed together, of such a size that its edges may be secured by screws and flanches around the edges of the aperture in which the joint or axis works, to the inner sides of the pump barrel, without impeding the action of the lever. So that as the piston is worked up or down the flexible material will be alternately in a state of tension or relaxation above and below the working joint. In order to make a flexible material answer the purpose of a stuffing-box where rectilinear motion is used, a plate is fixed in the upper part of the pump barrel, through which the piston-rod—which is in this case a tube or cylinder—works; the flexible material is a cylindrical bag, and is attached by one end to the plate, and by the other to the piston-cylinder, which, on receiving an up or down motion from the pump handle, draws the flexible material into a state of tension and collapse as it rises and falls. In order to construct the lower part of the pump so that access to the lower valve may be readily obtained in case of need, a cupola-shaped cap is screwed to the lower part of the pump barrel, by unscrewing the flanch of which the cap can be sliden up the pump barrel, and afford the easy access required. The mode of regulating the rectilinear action of the piston-rod with an easily adjustable guide, is as follows:—The bucket or piston, rod and slings, are constructed in the usual manner, but the guide, instead of being a bar fixed across the upper part of the pump barrel as heretofore, is formed of a conical shaped ring so as to drop at once into its proper position in the barrel, and has a bridge across it with an aperture through which the piston-rod works.

WILLIAM SAUNDERS, CHINA TERRACE, LAMBETH, SURREY, CHEMIST, *for certain improvements in paving streets and ways.* Roll's Chapel Office, February 3, 1841.

This is another of the numerous offsprings of the now somewhat abated wooden pavement mania, and consists—1st, of a new shape or configuration, in which a block of wood is to be formed; and 2nd, in the method of combining blocks of wood so formed as to make a firm and solid pavement to suit different circumstances, and which, when properly laid, will constitute a compact and

solid mass, each block being supported by, and also tending to, support the surrounding or contiguous ones. The new shape, or configuration (which it might well be supposed was hardly possible to be devised,) is obtained by taking two single blocks, as patented by Mr. Grimman—the plan adopted by the "Imperial Wood Pavement Company"—chopping one of them in two, and placing one thin piece on each side of the undivided block, reversing the angles, and thereby constituting a compound block of a new form and configuration, the employment of which, for fourteen years is safely secured to Mr. William Saunders, his heirs or assigns, by her Majesty's letters patent.

In order to obtain the proper angle for producing blocks of the required form, draw a rectangular four-sided figure, and divide the top and bottom into three equal parts; then, in order to obtain the angle, draw a line from the top left hand corner of the square to the first of the bottom divisions; and another line from the second point on the top line to the right-hand corner at the bottom. A block of the precise form being obtained in this way, two blocks of the same angular form, but of only half the width, are prepared and placed on either side of the first block, at opposite angles, and the three secured together by pins, dowels, or trenails, as may be best.

The compound block being thus composed of three blocks, the central block slanting in one direction, and the two outer ones in the reverse direction, on placing a number of such blocks together, they will, it is said, mutually support each other. Thus, for example, the central part of the first block rests upon, and is supported by the narrow parts of the two blocks immediately above, while the central parts of the same blocks rest upon the narrow parts of the first block in contiguity with the corresponding parts of the other compound blocks. From which it is evident, there is the same resistance to pressure upward and downward, but at the same time, the blocks can be removed endways with the greatest facility.

The claim is—1st, for the formation of a compound block for paving streets, roads, and ways, consisting of three distinct blocks, the centre one of which, is equal in solid contents to the two side ones, and the sides of which slope to the angle shown.

2nd, The method described of combining a number of these said compound blocks to form a compact and solid pavement, such blocks, when so combined, supporting, and being supported by each other.

Francis William Gerish, of East-road, City-road, Ironmonger, *for Improvements in apparatus to be used as a fire-escape, also applicable to other purposes where ladders are used.* EnrolmentOffice, Feb. 6, 1841

We have here "an old friend with a new face"; these improvements relating to the manufacture of Gregory's two plans of sliding ladders in *iron* instead of wood, with such trifling modifications as the change of material suggests or demands.

In the first plan the sides or uprights of the ladders are made of peculiarly shaped iron tubes. The ladder is in three parts, sliding one within the other; the rounds or steps of the lower ladder are fixed in their respective places to the sides or uprights of the ladder, but the rounds or steps of the two upper ladders slide on the uprights, and when the ladders are elevated, are retained in their proper places by means of jointed coupling links. The upper part of these links are attached to a strong axle lying across the two uprights, from which the whole of the steps become suspended. On the two extremities of this cross axle, two small wheels are placed to facilitate the traversing of the ladder up or down over projections in brick walls and other surfaces. Near the lower part of the first ladder of the series there is a small windlass with handles, pall, and ratchet; the former to elevate the ladders to the required height—the latter to prevent them from descending until released. From a small barrel of the windlass, on each side of the ladder, ropes proceed over two pulleys situated in projections at the top of this ladder, down to the bottom part of the second ladder, while a second set of ropes go on to the foot of the third ladder; so that on turning round the windlass, the second ladder rises from within the first, and the third from within the second, until their utmost elevation is attained. The steps sliding down into their places as the ladder is raised.

In the second arrangement, the ladder is in three parts, but the sides or uprights are made of iron plates bent up at two right angles to give the requisite strength. The uprights slide one within the other, but the rounds or steps are fixed in their respective uprights and slide one behind the other. A single rope is employed in this apparatus, and passes over pulleys which run upon the rounds or steps, being placed in the middle of the top round. Instead of a windlass, &c., &c., the rope is pulled by hand, and the ladders fixed at the required height by winding the slack of the rope round the lowest step.

The great difficulty hitherto encountered with these ingenious contrivances — even when made in wood —has been to get sufficient portability. How this difficulty can be lessened by the employment of so much heavier a material, is not very evident. One thing we think is certain, viz:—That Mr. Gerish's patent for these articles is not at all likely to be infringed.

The claim is, for the mode described of constructing iron ladders for fire-escapes

and other purposes to which ladders are applicable.

JOHN ISAAC HAWKINS, OF COLLEGE-PLACE, CAMDEN-TOWN, CIVIL ENGINEER, *for an improvement or improvements in buttons, and in the modes of affixing them to clothes.* Enrolment Office, Feb. 6, 1841.

These improvements (as communicated) consist, in the first place, in so forming the shank of the button that a recess or cup shall be left in the end of the shank for the purpose of allowing the rivetting to be effected with a small degree of force, and thus, that delicately ornamented buttons may be rivetted without injury from undue pressure on their ornamented surface.

2. In performing the operation of rivetting by means of a tool that shall press out the rim of the cup, turn it down, and leave an ornamented surface on the end of the rivet, either by a blow from a hammer, or by a press.

3. In the adaptation of a press having a recess in which a garment may be folded or rolled while a button is being rivetted at a considerable distance from the edge of the garment.

4. In forming a matrix or mould in which the ornamented or embossed face of the button may be laid while the shank is being rivetted, so that the resistance to the pressure may be afforded by the whole surface of the button, or by such parts of the surface as will bear the pressure without being injured.

Several methods of constructing buttons agreeably to the principle laid down, are shown; in one form the button is of a dished form, with a depression in the middle, and a hole through it; into this hole a shank formed on a disc, with a cavity on its upper end, is placed and then rivetted. In another case the button has a depressed surface, and a double shank and washer is employed. The shank may be hollow throughout like a short piece of tube, or it may be solid with its upper and lower end turned out forming cups; in this case the shank has a snoulder which serves to make the button stand out from the garment, forming a convenient recess for the button hole to lie in.

The matrix or mould for supporting the ornamented or embossed surface of the button while being rivetted, is to be made in the following manner:—A plaster cast having been taken from the surface of a button, is to be cast in type-metal by the ordinary process of flask casting, only that powdered rotten stone is to be used instead of sand, as it gives a much finer and better surface. Such part or parts of the button as are not to be pressed upon in rivetting are cut out of the matrix or mould. Other materials and processes for forming the matrices may be employed, but the above is recommended.

The patentee disclaims the method of rivetting buttons with solid shanks, but claims —1. The formation of the end of the shank of such buttons into the figure of a cup whereby a moderate degree of force applied to the brim of the cup pressing it first outwards and then downwards, will be sufficient to firmly rivet the shank upon the disc, or to rivet a shanked disc firmly upon a button.

2. The formation of a tool, to be operated on either by a press or by a hammer, for effecting of the rivetting of the rim of the cup with little force, and at the same time impressing the rivet with an ornamental surface.

3. The application of a press having a recess in which a garment may be folded or rolled while a button is being rivetted at a considerable distance from the edge of the garment.

4. The formation of a matrix, as described.

ROBERT STIRLING NEWALL, OF DUNDEE, GENTLEMAN, *for improvements in wire-ropes, and in machinery for making such ropes.*—Enrolment Office, February 6, 1841.

These improvements relate—1, To a mode of manufacturing wire-ropes by "laying" wires round a core to form a strand, and by "laying" strands round a core to form a rope when the number of strands in a rope exceeds three. The patentee does not confine himself to any particular core, as it may be of wire, hemp cord, spun yarn, or other fibrous material: or it may be a filament of cotton, or a strip of leather, or of hides. 2, To the construction of machinery for making wire-ropes, whereby the individual or separate wires are prevented from being twisted in themselves, and whereby the wires are laid into strands, and the strands into ropes. 3, To a method of joining, and of attaching a hook or eye, or other fastening to the end of a rope.

The machinery for manufacturing of the wire-ropes, though by no means complicated, is difficult to be intelligibly described from memory, especially when unaided by engravings: it consists, however, of a main shaft revolving in suitable bearings, and set in motion by a connection with a steam-engine or other convenient prime mover. This shaft is hollow to allow the cord or other material, which is to form the core of the rope, to pass through it from a reel placed behind it. Six arms are placed upon this shaft properly braced and strengthened; a second frame of six arms is fixed on the main shaft some distance in advance of the former but of smaller radius so as to revolve slower. Six bobbin-frames, each carrying six spindles, are supported between these arms. In the end of the shaft, tubes are fixed, the other end of which tubes revolve in bearings at the end of the machine. Several plates, with six equidistant holes in each of them, are fixed to different parts of the tube for the purpose of keeping the wires separate so that they will not be laid into a strand, until they arrive within a few inches of where the strands are laid into a rope.

The six bobbins disposed upon the six spin- ____ around the bobbin-frames, are filled with wire, while a bobbin in the centre carries the cord or other material to form the core of the strand. This core passes from the bobbin through a hole in the shaft down the tube, whilst the wires from the bobbins pass through inclined holes over the ends of the spindles, through inclined holes at the end of the shafts, through holes in the plates, and then meet round the core which passes through the shaft. On each of the bobbin-spindles toothed wheels are fixed, driven by intermediate toothed wheels, which turn on studs fixed to the arms of the bobbin-frames, and all so connected with the prime mover, that while the bobbin-spindles revolve and "lay" the wire upon the core forming the strand, the main shaft revolves at the same time but with a different motion, and "lays" these strands upon the core forming the rope. It will be evident that the angle of the "lay," or the quantity of twist in a given length of strand, will depend upon the number of revolutions the bobbin-frame makes, while the machine revolves once. The patentee recommends that the strands should have double the twist of the rope; the wheels, therefore, are so proportioned and adjusted that the bobbin-frames shall revolve three times, while the machine revolves once; and as one twist is taken off the strands in the act of "laying" them into a rope, two twists will remain on the strand, and the proportions of the wheels must be such that the bobbin-spindles shall revolve twice, while the bobbin-frame revolves three times, so that the wires will not be twisted in themselves, which they would be if they were not made to revolve in the reverse direction of the strand. The patentee recommends the angle of "lay" of a six-strand rope to be as follows:—

Diameter of rope	½	⅝	¾	⅞	1	1⅛ inches.
One twist in....	6	7	8	9	10	11 inches.

As the rope is formed it is drawn along through suitable rollers, and wound upon a large revolving drum; this drum is conical, and furnished with projecting paws around its smaller circumference, on turning down of which the wire rope can be taken off the drum without uncoiling it. When it is necessary to join the ends of two wires, it may be done by twisting them together for the length of a few inches, or when they are large enough, they may be joined by welding. It will be found, however, that if a wire is twisted, it will be materially weakened in proportion to the number of twists in a given length, and hence it is important in making wire ropes, that the individual wires of which they are composed should not be twisted in themselves, and it will be found that the machinery described above will effectually prevent the wires being twisted; will lay several wires together into a strand, and several strands into a rope, at one and the same time; and thereby make far more perfect ropes than could possibly be done when the strands are made first, and afterwards laid into a rope by hand.

An arrangement of the machinery upon a diminished scale for working by hand, is very fully described, with several very ingenious modifications. The machinery employed in the manufacture of wire ropes may be varied in various ways, so long as the mode of preventing the wires from being twisted is preserved. Although the machinery described, is for making strands and ropes of a certain number of wires and strands, yet the same machinery will be suitable for making strands of fewer wires, or ropes of fewer strands, by not putting some part of the machinery in motion. Or, machinery may be arranged for any number of wires and of strands, and either with or without cores; but when the number of wires and strands exceeds three, the patentee prefers the use of cores. In order to join two ropes, or to attach a hook eye, or other fastening to the end of a rope, it is passed into the narrow end of a conical metal thimble, and the end of the rope doubled in, the rope is then pulled back till the doubled-in part fits the thimble. Melted brass is then poured into the thimble among the bent up ends of the strands, which firmly secures them and effectually prevents their being drawn out of the thimble. The end of the other rope is treated in a like manner, and the two connected by a double screw, having a right and left-handed thread corresponding with screws tapped in the large ends of the conical thimble; the screw is then secured by being pinned through.

In order to preserve ropes of this kind as much as possible from decay, the patentee coats them with a mixture composed of six parts tar, two parts linseed oil, and one part tallow, melted together and applied hot: or they may be coated with a solution of caoutchouc in caoutchoucine.

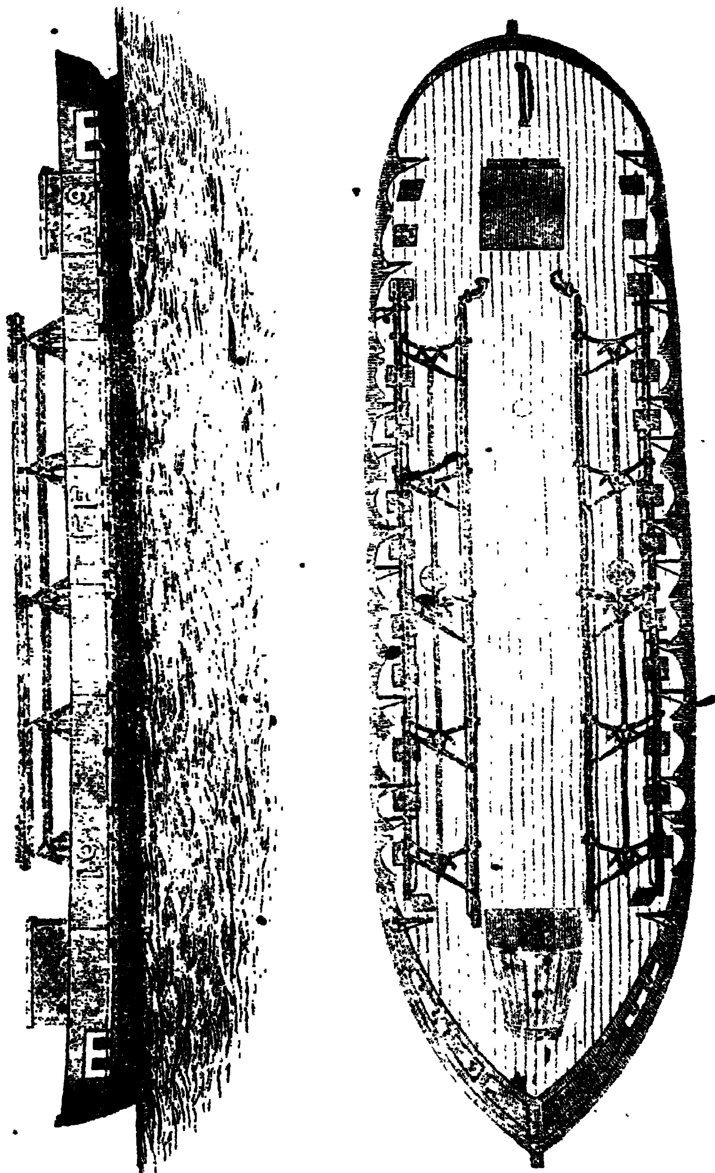
The claim is—1. The method of making wire ropes, whereby the several wires are prevented from being twisted in themselves. 2. The method of making wire ropes by laying wires round a core to form a strand, and by laying strands round a core to form a rope, when the number of wires or strands exceeds three, whereby the wire forming the strands, and the strands forming the rope, are kept at equal distances from the centre. 3. The laying the wires into strands, and the strands into ropes, at one and the same time. 4. The method of joining two ropes, or of attaching a hook or eye, or other fastening, on to the end of a rope.

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NEW FLOATING FIRE-ENGINE OF THE LONDON FIRE ESTABLISHMENT.

LONDON FIRES IN 1840.

"If in some town a fire breaks out by chance,
The impetuous flames with lawless power advance;
On ruddy wings the bright destruction flies,
Followed with ruin and amazing cries:
The flaky plague spreads swiftly with the wind,
And ghostly desolation howls behind."

Blackmore.

Sir,—Another year has departed! One thousand eight hundred and forty—with all its hopes and fears—is gone "with the dust of dead ages to mix." It, therefore, again devolves upon me to submit my annual record of one portion of the domestic calamities of the metropolis and its immediate vicinity—its conflagrations.

Accidents by fire may naturally be expected to be numerous in so populous a place as London; but I suspect the aggregate number of the past year will astonish many of your readers, and is considerably greater than the majority of persons have any idea of.

I had occasion last year to observe that the number of London fires in 1839 was the largest that had occurred since the formation of the London Fire Establishment, and I have now to repeat that remark, as it applies with equal truth to 1840. It is true, that we have not upon this occasion to lament the destruction of any of our public edifices; a vast amount of property, however, has been consumed—many irretrievable losses have been sustained—and what is most distressing, several valuable lives have been sacrificed to the imperfections and incompleteness of our Police Establishments.

MONTHS.	Number of Fires.	Number of Fatal Fires.	Number of Lives Lost.	Alarms from Fires in Chimneys.	False Alarms.
January	60	3	3	9	5
February	50	3	3	11	1
March	59	3	5	14	7
April	55	1	1	13	8
May	45	1	2	8	5
June	62	2	6	6	3
July	54	2	2	5	13
August	68	2	2	6	8
September	54	1	2	4	4
October	43	1	1	1	7
November	55	1	1	7	5
December	76	3	3	11	12
Total	681	23	31	98	84

The number of fires wherein the premises were totally destroyed, is 26
Ditto ditto ditto seriously damaged 204
Ditto ditto ditto slightly damaged 451
Alarms which proved to be occasioned by chimneys on fire* 98
False alarms, originating in error or design 84

Making the total number of calls 863

The number of instances in which Insurances had been effected on the Building and Contents 237
On the Building only 92
On the Contents only 101
Neither Insured 218

681

On reference to my last report (vol. xxxii, p. 376), where I gave an analytical table of London fires for the previous seven years, it will be seen, that

* Those known at the time to be such, are not included

the number of fires in 1840 has been greater than in any former year, since the formation of the London Fire Establishment, being 97 more than in 1839, and 163 above the average of the last seven years. Although I have spoken of this as an increase, yet if viewed statistically, I believe it would be found, that in relation to the increase of buildings and population, the same relative proportions as heretofore would be obtained.

The false alarms have borne the usual ratio to the fires, and have mostly originated in deceptive appearances, unusual lights, escape of steam or of smoke, &c. Some groundless alarms of fire have originated in the reprehensible practice of burning waste rubbish between sun-set and sun-rise. The burning of old beds at Giltspur-street Compter, and at Bridewell, being conducted in the open air, before daylight, has frequently set the Fire Brigade in motion, and disturbed the neighbourhoods by creating needless alarms. It is to be hoped, that in future these operations will be conducted at some better chosen period of the day, when there will not be any appearances to cause confusion and alarm.

The twenty-six instances, where the premises in which the fires originated were totally destroyed, are the following:—

January 8, 10½ P. M. Mr. Ryan's, picture frame maker, 7, Great Newport-street. This fire began in an extensive back workshop, from some unknown cause, and had attained a most fearful ascendancy before discovered. A severe frost which prevailed at the time, prevented a supply of water from being obtained for upwards of half an hour, during which time the flames had communicated to four other buildings; they were, however, most gallantly met by the firemen as soon as water was procured, and subdued in all, except that in which they originated.

January 12, 2½ A. M. Messrs. Dennis and Son, haberdashers, 68, Tooley-street. The origin of this fire was never discovered, it had gained a great head before discovered, and the premises were completely destroyed before a drop of water was obtained; the water was upwards of half an hour later than the engines.

February 4, 11½ P. M. Mr. Fuller's, rag merchant, 7, Star-court, Rosemary-lane. This fire was occasioned by the heating and spontaneous ignition of some rags; the firemen were on the spot with their engines twenty minutes before water was supplied, in which time the warehouse, a very small one, was consumed.

February 13, 7¼ P. M. Mr. Brewer, mast and block maker, Bermondsey Wall. This fire, from some unknown cause broke out in an immense pile of buildings filled with highly combustible materials, and had attained to a considerable head before it was discovered. Besides being a considerable distance from any engine stations, the firemen on their arrival had to contend with a lamentable deficiency of water, no water-pipes being laid down in this part. After some time, the engines were placed on the river side, and subsequently two floating engines were brought to bear upon the conflagration, which was eventually subdued, but not until four buildings had been entirely consumed, and eight more seriously damaged. There were nearly three hundred auxiliaries, in addition to a numerous body of firemen, engaged in this arduous conflict.

February 24, 11 P. M. Mrs. White, Park Villa, Twickenham. This fire originated in the bed-room of Mrs. White, who was burned to death, and though early discovered, from the absence of proper local assistance, the flames raged for a long time entirely unopposed. The Twickenham engine (a small one) was first on the spot, but was not provided with leather hose enough to reach from the nearest pond to the burning premises; on the arrival of a larger engine from Richmond, the two were placed in a line, and thus brought to bear upon the flames, but too late to be of any real service. No intelligence of this fire was given at any of the London fire engine stations until half-past three o'clock the following morning.

March 2, 9 P. M. Messrs. Johnson, printers (by steam power) Nos. 4, 5 and 6, Lovel's Court, Paternoster-row. Mr. Johnson left his premises between 7 and 8 o'clock, having first seen that the gas-lights were all safely extinguished, as also the fires under the boilers connected with the steam machinery, and conceived that all was safe. The origin of the fire therefore is unknown. The confined situation of the premises in the centre of a mass of buildings, and a delay in procuring an adequate supply of water, for some time thwarted the efforts of the firemen. A strong muster of firemen and engines were promptly on the spot, and the flames were met on all sides by columns of water poured from engines in Paternoster-row, Ivy-lane, and Newgate-street. Just before half-past eleven o'clock, the walls and floors of Mr. Johnson's premises, with their immense weight of type, presses, and machinery fell with a tremendous crash; several of the fire-brigade, who were close under them with their branches, had a narrow escape—one of the branches was de-

molished. In addition to the total destruction of Mr. Johnson's premises, twenty others around were more or less injured, but in none of them were the flames permitted to make much progress. It was a singular fact, that for nearly a quarter of an hour previous to the discovery of the fire, the inhabitants of some of the houses in Newgate-street, observed sparks rising from the centre of the square of buildings formed by Paternoster-row, Ivy-lane, Newgate-street, and Queen's-head-passage, but it was not until a dense volume of flames burst from the machine-house of Mr. Johnson, that they were aware of the cause.

March 6, 4½ A.M. Messrs. Blyth, Hamilton, and Hughes, feather and horse-hair manufacturers, 47, Upper Thames-street. This building was unusually lofty and capacious, having a frontage of 90 feet by about 100 feet deep: the height was 80 feet, comprising seven stories from the basement. It was the property of the worshipful company of fishmongers; it was built for a sugar refiner's, and used as such until about eight years ago. These premises were destroyed by fire in 1802 and rebuilt in 1804, and have been on fire three times within the last eight years. The present fire, which seems to have been occasioned by the fire heat employed in some of the drying process, had apparently been mouldering all night, as no traces of fire were discovered until the flames burst forth simultaneously from all parts of the building, illuminating the metropolis around for miles. An alarm was instantly given, but even at this early period the flames had attained such a tremendous ascendancy that it was impossible to discover in which story it had originated, the whole of them from the third floor upwards being one blazing mass. Engines and firemen from all the stations were promptly on the spot, as well as an abundant supply of water. Mr. Braidwood and some of his men boldly entered the lower floors and most gallantly endeavoured to prevent the progress of the devouring element downwards; they were, however, overpowered and compelled to retreat. The flames at length poured from every window in the building (36 in number) and its interior presented the appearance of a burning fiery furnace, upon which water seemed to have little or no effect. Nine of the brigade engines, one of the West of England, as well as the floating engine from Southwark-bridge, manned by nearly three hundred auxiliaries, poured a tide of water on the burning mass for a long time with no apparent effect;

"——but fruitless all!
Man may not fetter, nor ocean tame
The might and wrath of the rushing flame!"

The surrounding buildings were, however, preserved comparatively unscathed, ten of them being scorched or otherwise slightly injured.

March 9, 10½ A.M. Mrs. Ellis, corn dealer, corner of Salisbury-street, Portman-market. The place where this fire originated was at the upper end of a covered shed, 150 feet long by 60 feet wide, supported by numerous iron pillars; the fire commenced under very suspicious circumstances in some loose straw, and immediately communicated to a load of hay, whence it spread with great rapidity, and in less than five minutes, nine loaded carts, a waggon, and the roof, were one mass of vivid flame, and were speedily destroyed. The firemen were successful in preventing the flames from communicating to the adjoining buildings.

March 19, 10 P.M. Messrs. Cribb, Brothers, and Co., lucifer match makers, High-street, Hoxton Old Town. The stock in the workshops by some unknown cause ignited, and they were burned to the ground before any effort could be made for their preservation.

March 28, 11¼ P.M. Mr. Gadsden, oil and colourman, Princes-buildings, Featherstone-street, City-road. In this case the fire commenced in a small brick and timber building, occupied as a depository for the combustible matters appertaining to the occupier's trade, situated in a back yard; the flames raged with considerable violence, and threatened to involve three adjacent buildings in one common fate; the efforts of the firemen were successful, however, in confining the work of destruction to the building in which it commenced. The origin of the fire was not discovered.

April 6, 1 A.M. Mr. J. Barker, licensed victualler, sign of the White Hart, Millbank-street, Westminster. This building was so completely ignited before discovered, that the prompt attendance of the fireman and engines, and a plentiful supply of water could not save any portion of the premises; five adjacent buildings, to which the flames had communicated, were however preserved.

May 16, ½ A.M. Mr. John M'Latchie, baker, 21, Sidney-street, Commercial-road, St. George's in the East. This small house, (12 feet by 20 feet, and only one story high) was set on fire, by a spark from the oven, and entirely consumed before any engine could reach the spot.

June 9, 12 P.M. Mr. W. Currie, a dwelling house, partly occupied by lodgers, No. 9, Union-street, Friar-street, Blackfriars-road. This house was wilfully fired; the basement floors being saturated with turpentine, and the doors communicating with the stairs set open, the whole building was in a few minutes in flames from top to bottom. The firemen were promptly on the spot, but on

their arrival all hope of saving any portion of the building was at an end. No water could for a long time be obtained; the first was got, after the lapse of half an hour, from the Southwark main, 500 feet distant from the fire. The pipes of both the Lambeth and Vauxhall water-works are laid down in the street, and in three quarters of an hour a supply was given by the former, but not a drop was forthcoming from the Vauxhall mains. The Lambeth turncock of the district *was not called at all*, nor did he hear of this fire *till the following evening!*

June 16, 5¼ A.M. St. Andrew's Wharf High-street, Wapping, Messrs. Reynolds and Co., wharfingers. When this fire was first discovered it had spread so much, that it was difficult to say whether it had really commenced in the above premises, or, in those adjoining, in the occupation of Mr. Dark, a baker. A nephew of Mr. Reynolds perished in the flames, and his two female servants escaped with the greatest difficulty. The buildings on St. Andrew's Wharf were chiefly composed of wood, and being filled with goods of the most combustible description, they blazed away in a fearful manner, and before a drop of water could be obtained the fire extended in all directions. By 6 o'clock several engines were got into operation on the land side, shortly afterwards the floating engine of the London Dock Company, and the Brigade floating engines from Rotherhithe and Southwark-bridge stations, at a latter period. The origin of this fire or the spot where it began, have never been ascertained; the combustible nature of the buildings and their contents, and the delay in obtaining water, rendered it impossible to stop the progress of the fire, notwithstanding the extraordinary force ultimately brought to bear upon it, until seven buildings had been entirely consumed, seven more, seriously, and eight slightly damaged, besides several vessels of various sizes more or less injured. The numerous engines of the fire-establishment were manned by nearly four hundred auxiliaries on this trying occasion.

July 10, 3½ A.M. Mr. G. Colvin, Beer-shop, Great Green-street, Kentish Town. This was a large timber building, two miles distant from the nearest engine station, and with its contents was destroyed before the firemen could reach the spot: their timely arrival, however, preserved three adjoining buildings to which the flames had extended, with comparatively little injury.

July 20, 4½ A.M. Mr. Brooks, green-grocer, Wild-court, Lincoln's Inn-fields. This fire originated from some unknown cause in a stable, which with a loft over it, was totally destroyed; four adjacent premises ignited, but were rescued by the prompt attendance of the firemen and a plentiful supply of water

August 4, 2½ A.M. Mr. Senior, grocer and cheesemonger, Hammersmith. This was a small cottage, principally of timber, and was wholly consumed before the London fire-engines could reach the spot, the distance being upwards of three miles from the nearest station. The inmates were rescued with extreme difficulty, and the Hammersmith and Kensington engines brought up as quickly as possible, but were of little use owing to a deficiency of water. A late, but scanty supply was eventually obtained from the West Middlesex company's mains.

August 27, 1 A.M. Hore's Wharf, Wapping, High-street. This fire is supposed to have originated in the spontaneous combustion of some cotton waste, and when first discovered was raging in the fifth-story, which was filled with oil, turpentine, whiskey, resin, and other inflammable goods, the speedy ignition of which carried destruction to all parts of this extensive pile of buildings. Being near high-water, a plentiful supply of that necessary element was obtained from the basin at the London Dock entrance, along the sides of which, several engines were soon stationed. The floating engines from Rotherhithe, and from Southwark-bridge, as well as a new one at that time lying in the London Docks, were brought to bear upon the flames as expeditiously as possible, but such was their intensity that the torrents of water poured upon them had no perceptible effect, till the fury of the flames had subsided from lack of fuel, and nothing remained of Hore's Wharf and its valuable contents, but a mass of blackened ruins.

Three quarters of an hour after the commencement of this conflagration, the breaking out of a second was announced, which proved to be the dwelling house of Mrs. Mead, 1, Hereford-terrace, Oxford-street, Whitechapel; and the whole of the house (a very small one) and its contents was entirely destroyed before assistance could reach the spot.

By 4 o'clock the fire at Hore's Wharf had been reduced to definite limits, when the illumination of the horizon in a southerly direction announced another terrific conflagration "over the water." Several engines were instantly made up, and galloped off towards this new scene of destruction, which proved to be the saw mills of Mr. Fear, in Long-lane, Bermondsey. A sad want of water paralysed for a time the exertions of the firemen, and the flames communicated to the extensive premises of Mr. Husband, leather dresser and currier, and to 10 other buildings adjoining. Mr. Fear's premises were entirely destroyed, Mr. Husband's very seriously, and the others slightly damaged. On this eventful morning, within five hours, three fires in the metropolis involved the de-

struction of property to the amount of upwards of 100,000*l.* Besides the attendance of a strong force of firemen at these fires, upwards of 700 auxiliaries were paid for working the engines and otherwise assisting, besides a very large sum expended in refreshments.

October 6, 10¾ P.M. Messrs. M'Neil, Williams, and Co., patent felt manufacturers, Lamb's-buildings, Bunhill-row. This fire, which was at first supposed to be wilfully occasioned, seems to have had its origin in spontaneous combustion; it was early discovered in a kind of lumber room, and an alarm raised. Two engines from the Whitecross-street station, with a suitable compliment of the brigade men, were on the spot in a few minutes, and could they have obtained water, would easily have extinguished the flames before they had extended further; unfortunately, however, 20 minutes elapsed before water was supplied, by which time the flames had spread all over the premises, filled as they were with the most inflammable materials. A strong force of men and engines was soon in attendance, and a tolerable supply of water being subsequently obtained, they were enabled to preserve the adjoining buildings (18 in number, to which the fire had communicated), comparatively uninjured, the destruction being principally confined to the premises in which it began. These premises were destroyed by fire just four years previously, when a similar deficiency of water was experienced.

October 15, 8 A.M. Messrs. Hardy and Page, cork-burners, John's or Leg-court, Great Peter-street, Westminster. This was a small cork-burner's warehouse, only one story high, and accidentally ignited from the hazardous nature of the trade; the noisome character of the smoke prevented the inmates or neighbours from making any successful efforts to check the flames, which consumed the building before the firemen reached the spot. The flames communicated to three adjoining buildings, but these were happily preserved.

November 29, 4½ A.M. Mr. H. Beazley, baker, 16, Rotherhithe-wall. This fire, which seemed to have been occasioned by the heat of the oven, is supposed to have been burning several hours before it burst forth, which it did during the prevalence of one of the densest fogs ever witnessed in this metropolis. The policeman on duty in Rotherhithe-wall smelt fire, but was unable for some time to discover from whence it arose. At length he discovered the flames to be raging in the lower part of Mr. Beazley's premises. The fire extended with fearful rapidity, but owing to the fog, the flames were invisible at a very short distance. The brigade engine stationed at Rotherhithe was got out as quickly as possible, but no water being laid down, it was some time before it could be placed so as to work from the river. The floating engine moored off Rotherhithe Church was brought alongside, and the three engines it contains were worked separately, and proved of infinite service. In consequence of the fog, much time elapsed before intelligence could be given at the distant engine stations, and from the same cause the men and engines were compelled to proceed at a walking pace to the fire. The consequence of this combination of untoward circumstances was, that two houses, mostly of timber, and only one story high, were completely consumed, and five others seriously damaged, before the progress of the devouring element could be stayed.

December 14, 2½ A.M. Mr. Bale, licensed victualler, sign of the White Horse, Church-street, Chelsea. This fire, when first discovered, was raging furiously in the lower part of the building, which was very old, and built entirely of timber. In little more than five minutes, the premises were on fire from top to bottom, and so powerful was the body of flames that burst forth, that notwithstanding the wind was due east, they soon communicated to several houses on the east side of the street. The fire ladders which were kept at the church opposite were chained and locked up, and the inmates (with one unfortunate exception) all escaped by precipitating themselves from the windows. The parish engine was not got out for some time, in consequence of the key of the gate not being forthcoming! A mounted express being dispatched to town for the engines, those from the western brigade stations were soon on the spot, in time to save the premises to which the fire had communicated, but the original seat of the fire was consumed ere they could possibly arrive.

December 26, 7¾ A.M. Messrs. Goodhart and Sons, sugar refiners, Nos. 3 and 4, Ratcliffe Highway. The fire in this case is supposed to have had its origin in one of the stoves employed in this hazardous manufacture, and the flames suddenly burst forth with great vehemence. The firemen and engines from the adjacent station in Wellclose-square were promptly on the spot, but were unable to procure any water for twenty minutes. A strong force of men and engines poured rapidly in, but from the nature of the premises, and the inflammable character of their contents, the flames had made such a progress in the time that elapsed before getting water, that it was impossible to save any portion of this building. A new sugar-house belonging to the same firm, communicating with the old one, was saved, as were five adjoining buildings to which the fire had extended. At an early period of

the conflagration one of the high walls fell with a tremendous crash, overwhelming some of the brigade men in the ruins; one of them, Robert Loader, received such serious injuries that he subsequently died in Guy's Hospital, to which he was removed as soon as extricated from the ruins; his comrades were more fortunate, escaping with comparatively trifling injuries.

December 29, 11¼ P.M. A small detached timber shed, used as a smith's shop, belonging to the Southwark Water-works, in Battersea-fields, took fire from a spark which had fallen upon combustible matters in the course of the day, and was burned down before any assistance could reach the spot.

These were the whole of the *total losses*, but the following were serious fires, both as regards the amount of property destroyed and the extent of the conflagration. The flames had in each case attained an alarming ascendancy before discovered, and the ultimate rescue of a portion of the premises by the indefatigable exertions of the firemen, justly entitles them to great praise.

January 21, 1½ A.M. Messrs. De la Rue and Co., card makers, pocket-book makers, and fancy stationers, Bunhill-row, Chiswell-street. This fire broke out in a part of the premises called the binding and pasting-rooms, and from its lying at the back of the buildings in Bunhill-row, had spread considerably before discovered. This portion of the premises was in immediate connection with the other part, containing powerful stamping presses, engraved embossing rollers of the most costly description, and other highly valuable machinery, besides large stocks of paper, card boards, &c., to a great amount. The firemen, guided by the light, arrived very quickly from all the stations, but suffered at first from a scanty supply of water; however, the most praiseworthy efforts were made, and crowned, as they deserved to be, with success; the destruction being almost entirely confined to the building in which the fire began, and all the valuable plant preserved uninjured. Besides a strong muster of the brigade men, 120 auxiliaries were engaged upon this occasion.

January 23, 1½ A.M. Mr. Long's flour-mill, at Old Ford, Middlesex, was set on fire by the friction of the machinery, and with his dwelling house adjoining was almost entirely consumed. Three other buildings were preserved with slight damage.

February 6, ¾ A.M. Mr. Else, tobacconist, 63, Jermyn-street, Piccadilly. This fire began in the shop, from some undiscovered cause, and the flames quickly ran up stairs through the building, which, with the contents was seriously damaged. Four adjoining buildings took fire, but were preserved from serious injury by the skilful exertions of the firemen.

February 29, ¼ A.M. Mr. Braham, lucifer-match maker, Webb-square, Church-street, Shoreditch. This fire was occasioned by the accidental ignition of the explosive mixture employed in this dangerous manufacture: the roof and attic floors were completely destroyed, and the rest of the building very seriously damaged. Two adjoining buildings were also slightly injured.

Same morning, 4¾ A.M., a fire broke out in Pewterer's Hall, Lime-street, Fenchurch-street, in the occupation of Messrs Townend and Co., hatters. The cause of this fire was unknown, and the flames had made great progress before they were discovered; the building, which was a very old one, had a great quantity of timber in its construction, and from its confined situation, rendered the suppression of the fire a work of incredible difficulty. The fire communicated to five surrounding buildings; however, by dint of the exertions of a strong force of firemen, aided by upwards of a hundred auxiliaries, the fire was at length extinguished, Messrs. Townend's premises being seriously, and the others slightly damaged.

March 26, 10¼ P.M. Mr. Parker, pocket-book maker, 18, Old Fish-street, Doctor's Commons. The fire commenced in the attic story of a high building, occupied as workshops, the whole of which, with the roof, was enveloped in flames almost as soon as discovered. Firemen and engines from the adjacent stations were soon in attendance, and by carrying the leather hose up stairs, they succeeded after an arduous struggle in confining the damage to the floor on which it commenced.

March 18, 1½ P.M. Messrs. Bryand and Gregory, gun-case makers, Wardour-street, Soho. This fire broke out suddenly in the workshops during the absence of the workmen at dinner, and from the quantity of shavings and wood which they contained, the premises burnt with great fury. The firemen were soon in attendance, and the engines brought to bear upon the burning pile, and upon the buildings around, which at one time seemed doomed to destruction. Their efforts were successful, and in a short time the fire was stopped, the workshops being nearly destroyed, but the dwelling house and adjoining premises were preserved almost uninjured.

April 15, ¼ A.M. Messrs. Shaw and Maxwell, wine merchants, 7, Salisbury-street, Strand. It appears that workmen had been employed repairing the gas-meter and fittings, which they had not left secure, the consequence of which was, the gas escaped in considerable quantities, and filled the

lower part of the premises. The attention of the inmates being excited by the unpleasant smell, they proceeded down-stairs with a lighted candle, when a terrific explosion ensued, and in a few minutes afterwards the house was on fire from top to bottom. The shock was so great, that every pane of glass in this, and the opposite house, as well as the other houses around was blown to atoms. The houses on the right and left of No. 7, were slightly damaged by fire and water, those injured by the explosion amounted in all to thirteen. In number 7, the building was seriously damaged on every floor, the roof burnt off and the contents nearly destroyed; a strong force of firemen, aided by a hundred and fifty auxiliaries, prevented the further extension of the conflagration.

April 17, 3 A. M. Mr. Berry, Pastry-cook, 16, Great Turnstile, Holborn. Mr. Berry had been busily engaged in the preparation of "Hot Cross Buns," for this day—Good Friday; and either from the over-heating of his oven, or from an escape of gas, at the time mentioned the shop was discovered to be in flames. The house is one of the most ancient in London, having many years ago formed part of the mansion of Whetstone-Park, it was therefore, as may well be imagined, constructed almost wholly of timber, the extremely confined situation of the premises also, greatly increased the danger and difficulty of dealing with the fire. The Holborn engines, however, were instantly on the spot, and rapidly followed by those from the other adjacent stations, and water being obtained, the firemen gallantly dashed into the burning building, and most resolutely maintained their positions, vigorously pressing forward until completely victorious. The shop was burned out, and the building very seriously damaged throughout, but not a floor gave way; the triumph achieved in this case, was manifest to every person on an inspection of this curious old building; which still stands, a lasting monument to the skill and bravery of the firemen.

April 18, 2½ A. M. Messrs. Rawlins and Son, marine store shop, 25, Gravel-lane, Southwark. This fire broke out on the ground floor, at the back part of the premises, and rapidly ascended the staircase. The engines were soon on the spot, but could get no water. On reaching the spot, I found five or six engines were placed ready for working as soon as water could be obtained; on interrogating the police, I found that the turncock of the Southwark water works, who have no pipes in that district, *had* been called; but that the turncock of the Lambeth company, to whom the pipes belonged, *had not* been called. Having rectified this blunder, in less than eight minutes afterwards a plentiful supply of water was given, the fire extinguished, and the lower part of the premises preserved. The two upper floors and roof were destroyed. Had the proper turncock been called in the first instance, the fire would have done very little damage; as it was, full half an hour was completely lost.

May 3, 6½ A. M. Messrs. Brandram's chemical and colour works, in the Lower-road, Deptford. At the time stated, a fire was discovered to be raging in one portion of these extensive works; some of the workmen having assembled, they made an ineffectual attempt to check the advancing flames, with a small engine belonging to the firm, messengers in the mean time being dispatched to the brigade stations for more efficient aid. A number of engines were on the spot as soon as the distance would permit, and water being obtained, were promptly in full operation, being manned by 160 auxiliaries. The premises being filled with oil and other highly combustible matters, the flames raged for some time with great fury, but were eventually suppressed, and their ravages confined to the colour manufactory, warehouse and wash-house. The extensive oil warehouse, and other valuable stores were saved.

May 5, 1 P. M. Messrs. H. and J. Aste, corn-chandlers, Mortimer-market, Tottenham-court-road. Some boys were amusing themselves with kindling a bonfire close to the door of a straw warehouse, when some of the embers were carried into the warehouse and set it on fire. The roof was burned off the warehouse, and its contents (about 20 loads of straw) consumed; four adjacent buildings were slightly damaged.

May 14, 1 A.M. Mr. Clark, cheesemonger, 33, Marylebone-street, Golden-square, immediately behind the Regent's-quadrant. The origin of this fire has never been satisfactorily explained, it was discovered to be raging in the shop, by Mr. Clark who slept in a room behind it. He stated that he was awoke by a crackling noise, and on looking up saw the wainscoating of his room on fire; he instantly jumped out of bed, rushed out of his house in his night things and rang the fire-bell at the engine-house of the County fire-office, which was only two doors off. Mr. Carter, the foreman, instantly ran down stairs and turned out both his engines. Engines from the surrounding parishes and the brigade stations arrived in quick succession, but in consequence of a delay in sending for the turncock, upwards of twenty minutes elapsed before any water could be obtained, in the course of which time the flames ran up through the building with increased and increasing fury, and it was only by subsequent extraordinary exertions on the part of the firemen that any portion of the building or contents was preserved. Of the fatal con-

sequences of this fire, I shall have to speak under another division of my subject. Seven buildings in all were damaged by fire and water.

May 24, 4 A.M. Mr. Hinton, oil and colourman, 39, Great Peter-street, and 3, Ann-street, Westminster. The fire from some unknown cause broke out in the shop, which was well stocked with all those various combustibles upon which flames prey so fiercely. Notwithstanding the fury with which they burnt, the prompt attendance of the firemen and a timely supply of water, enabled the mischief to be confined to the shop, which was burned out. The conflict was a sharp one while it lasted, and the victory was highly creditable to the firemen.

June 1, 2 P.M. Mr. J. S. Robinson, cabinet maker, 154, Goswell-street. The fire commenced accidentally in the upper floor, and had got a good hold of the building when discovered; the prompt arrival of the firemen and a good supply of water enabled them to save all below; the roof, upper floor and contents, only being destroyed.

June 2, 2½ A.M. Mr. Jno. Deal, cowkeeper, Hayfield-passage, Mile-end-road. This fire commenced in a low timber building, and soon extended to three others; the former was very seriously, and the latter but slightly injured.

June 3, 5½ P.M. Mr. Smith, lucifer-match maker, Ponderson's-gardens, Bethnal-green-road. Through the carelessness of a boy employed in the manufactory, a large quantity of composition exploded with a loud report, and set fire to the building. The manufactory consisted of a double three story brick building; the roof was burned off, the upper floor burned out, and the first floor seriously damaged, but the remainder of the premises was preserved.

June 7, 2½ A.M. Mr. Price, bookbinder, 25, Ivy-lane, Newgate-street. This fire began in the shop, and was attended with most calamitous results, as will be noticed elsewhere; it is supposed to have originated from a candle-snuff dropped among some paper-cuttings in the shop, where Mr. Price and his work-people were engaged up to 11 o'clock the previous night; although Mr. Price, who was the last to leave, imagined all was left safe. The first intimation of a fire was given by the smell, which attracted the attention of the police, they passed up and down Ivy-lane several times, where the smell was very strong, but they were for a long time unable to discover the seat of the fire. At last the issue of a dense body of smoke, and the appearance of a light in the shop of Mr. Price, too plainly indicated the locality of the mischief. Messengers were dispatched to the nearest engine-stations, from whence assistance was promptly given, but on their arrival in Ivy-lane, the premises were on fire all through, and extensive destruction seemed to threaten this confined neighbourhood. The exertions of the firemen, however, were successful in arresting the progress of the flames, Mr. Price's house and contents being nearly destroyed, and nine adjacent premises slightly damaged.

June 10, 11¼ A.M. Cannonbury Villa, Islington. Two unfinished houses were set on fire by the carelessness of the workmen, and nearly consumed before assistance could reach the spot.

June 19, 1½ A.M. Mr. Dean, grocer, 91, Fleet-street. This fire began in the shop and ran up the stairs almost before discovered; the firemen from the Farringdon-street and other stations, were instantly on the spot and water being obtained, the fire was stopped in a masterly style: the kitchen, staircase, attics, and roof being destroyed, and the rest of the building seriously damaged.

July 3, 4 A.M. Mrs. Redshaw, upholsterer, 23, Frederick-street, Regent's-park. The smell of fire in this, as in a former case, had attracted the notice of the police, but who were for a long time at a loss to discover the "whereabouts." At length the flames were visible in a warehouse beneath the shop, from which they rapidly ascended; all the inmates happily effected their escape but with great difficulty. The intense volume of flames which issued from the windows of the building soon conveyed intelligence of the fire to all parts of the metropolis, and firemen and engines rapidly poured in from all directions, and were soon in full work on the burning pile. The building and contents were, however, nearly destroyed and four other buildings scorched and otherwise damaged.

July 16, 11½ P.M. Messrs. Wells and Son, cork-burners, Horner's-yard, Wentworth-street, Whitechapel. The premises consisted of two wooden buildings used as warehouses, nearly sixty feet long, thirty feet wide, and two stories high, situated in the most confined part of Wentworth-street. When the fire was first discovered, and for some short time afterwards, nothing was visible but a dense body of suffocating smoke; the firemen and engines were soon on the spot, and it was hoped that the fire would be speedily got under. The firemen were, however, for a time beaten back by the overpowering volumes of smoke, and the flames ultimately burst forth and illuminated the surrounding district. After an arduous struggle the firemen were as usual victorious, the warehouses of Messrs. Wells, with nearly twenty tons of cork which they contained,

were all but destroyed, and seven adjoining buildings more or less damaged. The brigade engines were manned by eighty auxiliaries, in addition to a strong muster of firemen; an engine from Messrs. Hanbury's brewhouse, worked by their servants, was also engaged.

August 18, 1¼ A. M. Mr. Holling's private dwelling-house, No. 3, Laystall-street, Liquorpond-street, Gray's-inn-lane. The fire broke out in the lower part of the house; on the inmates being roused from their slumbers by the policeman on duty, they found their retreat by the usual outlet cut off, and they flocked to the first and second floor windows calling loudly for assistance. A set of portable fire-escape ladders, belonging to the parish, were instantly brought to the spot and raised, when the inmates all descended in safety. Mr. Thomas Edward James, of Little Saffron-hill, was the party who rescued these individuals, and they had no sooner quitted the house than the flames occupied the apartment. The engine of Messrs. Reid's brewery was soon out and at work, and being rapidly followed by those from Farringdon-street and Holborn stations, the fire was quickly extinguished. The ground floor, staircase, and attics, were seriously damaged—origin of the fire unknown.

August 24, 10¾ A. M. Mr. Winsland, builder, Duke-street. Bloomsbury. These premises were occupied as workshops for manufacturing the internal fittings of houses: they extended over half an acre of ground. The fire originated in the deal plank warehouse, through some defect in a steam-furnace, and the whole of the place being full of dry wood and shavings, the fire ran through the whole range of buildings in a few minutes, and the workmen had great difficulty in effecting their escape. In addition to a strong muster of firemen and engines from the brigade stations, manned by two hundred auxiliaries, the engines of St. Giles' and Bloomsbury parishes, engines and men from the breweries of Messrs. Combe, Delafield, and Co., and Messrs. Meux, as well as a steam-engine at Messrs. Tanquery's distillery cooperated in the suppression of the conflagration. From the inflammable matters with which Messrs. Winsland's premises were stored, the flames raged tremendously, and there was some difficulty at first in obtaining water enough for the numerous engines that were in attendance; the surrounding houses in Brewer-street, Museum-street, Broad-street, and Vine-street, were in serious jeopardy, the fire having communicated to several on all sides. By the most extraordinary exertions, however, the flames were at length beaten, Messrs. Winslands' premises and contents being nearly destroyed, and twenty-nine other buildings more or less damaged.

August 30, 5¼ A.M. Mr. Parker, law-stationer, 35, Cursitor-street, Chancery-lane. The cause of this fire was not known, it began in the lower part of the premises, and burnt very rapidly; the firemen were promptly on the spot, and entered the building in fine style, advancing as the flames were beaten down, until they were completely extinguished. The two upper floors and roof were destroyed, the remainder of the premises seriously injured, and five adjacent buildings slightly damaged. This fire was considered, by competent judges, to have been exceedingly well stopped.

Sept. 3, 4 P.M. Mr. Johnson, cabinet-maker, 25, Curtain-road, Shoreditch. A spark having accidentally fallen among some loose shavings, four upper rooms used as workshops were burned out and part of the roof off.

Sept. 4, 10¼ P.M. Mr. Farmiloe, glass-cutter, 20, Goswell-street. This fire (the second in five years) was of doubtful origin, and burned all through the building (a small house) in a very short time, but was soon stopped.

The same night at 11¾ P.M. A fire occurred accidentally at Mr. Sherman's, cabinet-maker, &c., 20, Rawstone-street, St. John-street-road. The back workshops were all but destroyed, but the dwelling-house was preserved uninjured.

September 12, 1¾ A.M. Mr. Vanderstein, sign of the Jacob's Well, Milton-street, Cripplegate. This fire broke out from some unknown cause, and was attended with a melancholy loss of life. When first discovered it was burning from the bar backwards. The police imprudently burst open the shop door, which increased the fury of the flames. The engines from the Whitecross-street station were almost immediately on the spot, and water being obtained, were soon in operation with the best effect. The neighbourhood is a very confined one, and the building very old and mostly of timber. The fire communicated to three other houses, but they were preserved, and the damage confined to the Jacob's Well, the bar, stairs, and attics being destroyed, and the roof partly off. Eighty auxiliaries assisted the firemen upon this occasion.

September 22, 10¼ P.M. Mrs. Latter, pawnbroker, 20, Hereford-place, Commercial-road, St. George's-in-the-East. This fire, from some unknown cause, commenced in the store-rooms which occupy nearly the whole upper part of the building. On the arrival of the firemen they led the hose upstairs and entered the burning apartment, by which means they prevented the flames from descending further than the second floor; the

upper floor and contents, and the roof, were nearly destroyed. Three adjoining buildings were slightly injured; a strong muster of firemen and 120 auxiliaries were employed in stopping the spread of this fire, which at one time assumed a truly alarming aspect.

September 30, 1 A.M. Messrs. Richards and Taylor, wadding manufacturers, James-street, Kennington-common. This fire originated from the boiler furnace being over-heated, which ignited some of the timbers of the building. The fire was early discovered by the police, and the engines promptly on the spot, but the absence of water for some time crippled their exertions; a supply was ultimately obtained, and the progress of the flames stopped; the boiler-shed and drying-room were burned down, but the valuable plant and machinery, and rest of the building, were preserved.

October 2, 8½ P.M. Mrs. Crouch, lodging-house, 28, Tavistock-place. Caused by accidentally setting fire to a curtain, and consumed the three upper floors and roof of this building, and communicated to the two adjoining ones; but by the exertions of the firemen, and one hundred and forty auxiliaries, the damage to them was very slight.

October 3, 7¾ P.M. Mr. Harris, hat manufactory, Winchester House, Southwark-bridge-road. These premises are very extensive, forming three sides of a large square. The fire was caused by a stove, and commenced in the dyeing department of the manufactory. Two brigade engines from the Southwark-bridge-road station were instantly on the spot, and could a sufficient supply of water have been obtained to work *one* of them, there is no doubt the fire would speedily have been extinguished. Nearly half an hour elapsed before water arrived, by which time the southern wing of the building was one mass of vivid flame. As soon as water was obtained, the numerous engines that were in readiness commenced working with good effect, and the fire was cut off from the western wing of the building. The building and contents of the south wing were very seriously damaged, but this portion was of very trifling value in comparison with that which was preserved.

October 18, 12 P.M. Messrs. Samuda, Brothers, engineers, Southwark Iron Works, New Park-street, Bankside. This fire originated from the furnace igniting a high timber building used as workshops, which was on fire from top to bottom in a few minutes, and assumed a most fearful appearance. The greatest apprehensions were entertained that the whole of these premises (wooden buildings) would be destroyed and involve the surrounding ones in a like fate. A tolerably good supply of water, however, enabled the firemen to stop the fire, and confine the damage to the building in which it first began; seven adjacent buildings very slightly damaged. The wind was, however, blowing a perfect hurricane at the time, and a perfect shower of fiery particles poured down upon all the buildings lying to the north-east of Messrs. Samuda's premises, many large pieces of the burning embers being carried across the Thames. Some of them unfortunately fell among the timbers in Messrs. Rosling's yard, which adjoins the Southwark-bridge, extending from Bankside to Park-street; the entire place was filled with immense stacks of timber reaching from the ground to the summit of the bridge, and some of them rising considerably above it. The premises also extended under the dry arches of Southwark-bridge, which were occupied as saw-mills. At 2 A.M. on the 19th as the firemen were about leaving the first fire, which had been safely extinguished, an alarm was raised that Messrs. Rosling's premises were burning, the firemen instantly hastened thither and found the report too true; some of the driest of the timber having been ignited. The position and character of the wood was so favourable for the progress of the flames that in a few minutes they attained an awful ascendancy. Water being instantly procured several engines were soon in operation, and in a short time the powerful floating-engine from Southwark-bridge was brought alongside and got to work, the branch of it being taken into the heart of the fire. The most extraordinary efforts were made on all hands, and with such success that the fire was cut off on the south side of the chimney shaft, the whole of the stock and building north of that point being preserved uninjured. None but those who, like myself, saw this fire, can possibly form an adequate estimate of this achievement. Had the force engaged been five times greater than it was, the triumph was one, of which they might still have been justly proud. It was a singular fact, and one that reflects the greatest credit upon the attention and watchfulness of Mr. Braidwood, that while the former fire was raging, he sent a fireman to examine and watch Messrs. Rosling's premises, and to remain there in case of danger; this he did in company with Messrs. Rosling's watchman, but who refused, after he found all safe, to let him stay!

November 11, 2¼ A.M. Mr. W. Kent, tanner and morocco leather dresser, Tyer's-gateway, Bermondsey-street. These premises consisted of one large timber building about 200 feet long, 80 feet broad, and 40 feet high, and comprised three distinct manufactories tenanted by three different individuals. The fire, which is supposed to have been occasioned by a stove, broke out nearly in the middle of the building, and had made considerable progress when discovered. Several engines, attracted by the light, were soon on

the spot, and the ditches being full of water, were speedily in operation, and the firemen succeeded in saving the one-half of the building, the other half only falling a victim to the flames.

November 30, 10 P.M. Mr. Wharton, hatter, 54, Leicester-square, corner of Sydney's-alley. These premises were very extensive, forming three separate shops. The fire was discovered to be raging in the corner shop occupied by Mr. Wharton, and burnt so fiercely, that in five minutes it had enveloped the first and second floor in flames, and extended across Sydney's-alley, and also across Leicester-street. In about ten minutes a plentiful supply of water was afforded, and the engines poured in from the various stations in quick succession; a strong muster of the brigade and upwards of two hundred auxiliaries were opposed to the devouring element for about two hours, by which time they were completely victorious. Mr. Wharton's premises with their contents were nearly destroyed, and six adjacent buildings severely damaged.

December 17, 2½ A.M. Mr. Hoare, private-dwelling, No. 1, Queen-square-place, Westminster. Cause unknown; the greater part of the building and contents destroyed, and three adjoining buildings to which the fire had communicated were only rescued by extraordinary exertions on the part of the firemen.

December 25, 1 A.M. Mrs. Stafford, private-dwelling, 2, Clarence-place, Woolwich-common. The fire was occasioned by the accidental ignition of a bed curtain in the lower part of the house and spread with such extrordinary rapidity that the whole building was soon one body of fire which extended to those adjoining. Six engines from the barracks of the Royal Artillery and one from the Dock-yard were soon got out but proved useless for want of water. When the fire was found to be gaining such an alarming height, a mounted express was sent to town for assistance; an engine from the Southwark-bridge-road station, and a party of firemen instantly obeyed the summons, and by the time they reached the spot, water was happily supplied from the mains of the Kent water-works, and the firemen went to work in a masterly style and eventually extinguished the fire. Mrs. Stafford's house with its contents was almost wholly destroyed, and three others very seriously damaged.

The same day at 4 P.M., a fire broke out, accidentally, in the extensive workshops of Mr. Lawrence, carpenter and builder, 21, Pitfield-street, Hoxton, and from the nature of the contents burnt very rapidly. A strong force of firemen with the help of eighty auxiliaries soon checked the flames; one part of the workshops was destroyed, the remainder with the stock was considerably damaged.

"December 26, 11¾ P.M. Mrs. Bates, dwelling-house, 9, Prospect-terrace, Gray's Inn-road; tenanted by several families, who had a narrow escape, the cause was not known, but the fire burned so rapidly, that the building and contents from the first-floor upwards were very seriously damaged. Five adjoining buildings were slightly damaged.

December 30, 12 P.M. Messrs. Ditchburn and Mare, Iron boat-builders, Orchard-yard, Blackwall. Cause unknown, three-fourths of a wooden building (engine-house) and joiners' workshops destroyed, and two other buildings slightly damaged.

The foregoing enumeration contains the principal serious fires of 1840. Of the *consumed*, it will be seen that the greater portion was composed of comparatively small and unimportant premises, and their total destruction has been occasioned by their trifling extent, their distant situation, or the entire absence of water?

Of the *seriously damaged*, each was attended with its several untoward peculiarities and difficulties, and surmounted only by the most undaunted bravery and consummate skill on the part of the comparatively small force brought in array against them. Nor are the *slightly damaged*, though less prominent in their details, and many of them altogether unknown, save in the immediate vicinity of their recurrence, less creditable to those concerned; exhibiting as many of them do the most extraordinary activity and indomitable perseverance, and *only retained* in this class by the exercise of untiring energy, frequently under the infliction of great physical suffering, without which many of the slight damages would inevitably have proved serious fires, and all the serious fires, total losses.

The following list exhibits the occupancy of the various premises in which the fires have originated, discriminating as heretofore, between those which began in that portion of the building appertaining to the trade of the occupant, from those which have happened in, and been confined to dwelling-houses only:

Apothecaries and dealers in drugs, but no chemical works carried on	5
Bagnios	2
Bakers	16
Ditto, muffin	1
Carried forward	24

Brought forward	24
Basket makers	1
Beer shops	3
Booksellers, binders, and stationers ..	10
Brewers	1
Brokers, and dealers in old clothes....	5
Builders	1
Cabinet makers	14
Carpenters and workers in wood, not cabinet makers	38
Chandlers	5
Charcoal and coke dealers	2
Cheesemongers	2
Churches	3
Cigar makers	3
Coach makers	2
Coffee and chop houses	4
Coffee roasters	2
Colour makers	3
Confectioners	6
Coopers	1
Cork cutters	2
Ditto burners	2
Corn Chandlers	3
Curriers and leather sellers	1
Drapers, linen, and woollen	18
Dyers	1
Eating houses	4
Farms	3
Feather merchants	2
Felt makers	2
Fire-work makers	1
Founders	1
Farriers and skin dyers	1
Grocers	12
Hat makers	8
Hotels and club-houses	4
Lamp-black makers	2
Laundresses	1
Lodgings	68
Lucifer match makers	10
Manchester warehouses	5
Marine stores, dealers in	3
Mast and block makers	1
Mattress makers	1
Millers	1
Carried forward	287

Brought forward	287
Musical instrument makers	2
Naptha manufacturers	1
Oil and colour men, not colour makers	10
Painters, plumbers, and glaziers	1
Paper stainers	1
Pawnbrokers	3
Playing-card makers	2
Potteries	1
Printers and engravers	4
Ditto, copper-plate	4
Ditto ink makers	2
Private dwellings	204
Public buildings	3
Rag merchants	6
Railways	1
Rope makers	4
Sack makers	1
Sale shops and offices containing no hazardous goods	29
Saw mills	2
Ships	5
Ditto steam	1
Ship builders	1
Soot merchants	3
Stables	20
Sugar refiners	1
Tailors	5
Tallow chandlers, wax chandlers, melters, and soap makers	2
Tanners	1
Tar distillers	3
Tarpauling makers	1
Tinmen, braziers, and smiths	4
Tobacconists	3
Type founders	1
Under repair and building	5
Unoccupied	3
Upholsterers	1
Varnish makers	2
Victuallers	35
Wadding makers	1
Warehouses	4
Weavers	3
Wine and spirit merchants	7
Wood merchants	1
Total	681

The number of fires on each day of the week, during the past year, was as follows:—

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
101	106	96	107	86	103	82

Their hourly distribution throughout the day and night has been as follows:—

	First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
A.M.	54	35	27	20	10	16	10	12	8	22	24	9
P.M.	24	31	29	23	21	27	42	44	57	62	36	43

Whenever the early discovery of fires has permitted the prompt attendance of the firemen, they have generally been successful in tracing the cause of its origin, the result of which appears in the subjoined list, from which it will be seen that the ascertained causes of fire have been much of the usual character. Nine of last year's fires were known to have been occasioned wilfully, but for want of a "public prosecutor," the diabolical incendiaries remain "unwhipp'd of justice." In consequence of a most destructive fire having occurred in Devonport Dock-yard, which was at first supposed to have been wilfully kindled, but which at last was proved to have resulted from spontaneous combustion, public attention became a good deal directed to that curious subject. Mr. M. A. Booth, lecturer on chemistry, sent a letter to the Lord Mayor, in which he observed:—

"My attention was more particularly called to the subject of spontaneous combustion in 1829, from the circumstance of the execution of a young man named James Butler, who was convicted on a charge of setting fire to a floor-cloth manufactory. After his execution I became acquainted with the details, and, after most closely and carefully investigating the subject, came to the conclusion that he was an innocent victim of the law, in which view I was supported by my friend the late Dr. Gordon Smith, then professor of medical jurisprudence at the London University College, Dr. Birkbeck, and several other scientific men.

"The cases under which spontaneous combustion of animal and vegetable substances will take place are such as no ordinary sagacity can foresee nor prudence prevent. In the official reported list of fires the majority of causes are unknown, whilst another large portion are only conjectural. The science of chemistry may, however, advantageously lend its aid, and some of its investigations on the subject have been matters of high interest. The most memorable instance on record is that of a series of fires which took place at St. Petersburgh in 1780 and 1781, when a frigate with several other vessels and houses were destroyed, supposed to have been the work of an incendiary. A scientific commission was appointed by the Russian government to inquire into the subject, who found that the self-enkindling substances were charcoal, hemp, and oil. In 1757 the Royal Dockyard at Brest was nearly destroyed by spontaneous combustion taking place in the rope-yard, when some of the old workmen declared that the same thing had happened some years ago, but that, conceiving it impossible for the bales to take fire of themselves, they had concealed the accident, for fear of being taxed with negligence, and punished accordingly. On Thursday, July 3, 1760, a fire from spontaneous combustion broke out in the rope-yard of the Royal Dockyard at Portsmouth, which caused much mischief. It would be tedious to relate the other various circumstances under which spontaneous combustion will take place, such as with hay, corn, flax, cotton, wool, turf, flour, saffron, and other vegetable substances; rags, oatmeal, charcoal; woollen cloth and cotton goods; roasted coffee, and chocolate; bales of woollen yarn or cloth, waste cotton or rags used in cleaning oil, paint, floor-cloth, pyrites, coal, &c., although the subject is one of considerable importance in our domestic security."

There has been occasioned by—

Cause	Number
Accidents of various kinds, ascertained to have been for the most part unavoidable	23
Apparel ignited on the person (7 fatal)	12
Candles, various accidents with	67
Ditto, setting fire to bed-curtains (2 fatal)	53
Ditto, window-curtains	49
Carelessness, palpable instances of	21
Children playing with fire and candles (3 fatal)	16
Ditto, lucifer matches	5
Fires, sparks from (2 fatal)	15
Ditto, kindled on hearths and in other improper places	7
Fire-heat, application of to various purposes of manufacture and trade (1 fatal	31
Firework making	1
Flues, foul	53
Ditto, blocked up	9
Ditto, overheated	27
Friction of machinery	3
Fumigation, incautious	3
Furnaces overheated, &c.	15
Gas, sundry accidents from escape of	22
Ditto, escaping from street mains	5
Ditto, accidents from carelessness in lighting of	13
Ditto, in repairing fittings	7
Illumination	1
Intoxication (1 fatal)	5
Lamps, sparks from	3
Lime, heating of	2
Linen, &c., airing before fires (1 fatal)	25
Lucifer matches, making of (1 fatal)	10
Ditto, using of	8
Oven, defective, overheated, &c.	13
Shavings, loose, ignited	27
Steam-engine, locomotive	2
Spontaneous ignition of Coals	2
Carried forward	558

Brought forward	558
Spontaneous ignition of Cotton waste ..	2
Dung	2
Hay	1
Rags	3
Tan	1
Stoves, overheated, &c.	15
Drying	4
Portable	11
Pipe	13
Hot air	5
Suspicious........................	11
Tobacco smoking	9
Wilful	9
	644
Undiscovered (5 fatal)..............	37
	681

Of the foregoing fires, twenty-three have been attended with fatal consequences, a much greater number than in the year previous, although the number of lives lost is not quite so great.

May 14. At the fire which broke out at Mr. Clarke's, 33, Marylebone-street, two lives were lost, the sufferers being Mr. John Marr, cashier to the United Kingdom Assurance Company, aged 46; and Mr. Joseph Cowley, clerk to Messrs. Stultz and Co., aged 35 The alarm was first raised by Mr. Clark, who ran out of the shop in his night clothes and rang the bell at the County engine station, two doors off; he then returned into the house to get his clothes, having done which, he found he could not again repass the middle parlour for the flames, and he got out of a back window into the yard. He then ascended to the first floor window and got out the female servant. In the mean time a number of police constables, with Inspector Covington at their head, arrived from the station-house in Vine-street, and exerted themselves most meritoriously. Two of the lodgers were rescued with the utmost difficulty from the upper part of the premises by the police. Immediately, after this, the cries of the errand boy, who slept in the kitchen, were heard below the area railings; crow bars were instantly procured, but the heat from the shop was so great that the railings could not be got up. Inspector Covington and his men got into the next area and commenced breaking a hole through the wall which divided it from Mr. Clarke's, and eventually drew the poor lad through, unhurt. The evidence of Mr. T. W. Seppingwell, before the coroner, was most affecting:—"I slept," said he "in the front attic. Hearing Mr. Clarke calling out, I opened my door, but was almost suffocated by the hot smoke. I shut the door, and opened the window, and sat on the sill until I was nearly suffocated. I then went in, and shut down my window, *and gave myself up for lost.* I, however, rallied myself, and dressed in my trousers, waistcoat and coat, and taking my watch from under my pillow, rushed to the window again, got out, and was assisted along the cornice into the next house by the police. I saw Mr. Marr (one of the deceased) leaning out of the next window, and spoke to him. I could see three engines in the street ready to work but there was no water for twenty minutes."

The mutilated remains of Mr. Cowley were discovered in the afternoon of Thursday, lying between the ruins of the first and second floor; and on the following morning, those of Mr. Marr. From the position in which his body was found, it is supposed that he had endeavoured to rush down the burning staircase, and was with it precipitated to the basement. The jury returned a verdict "that the deceased had been burnt at a fire which occurred at the house of Mr. Clarke, in Marylebone-street, but how that fire originated there was no evidence to show." The jury further said "that their best thanks were eminently due to the police for their meritorious exertions in the preservation of three human lives, who would most probably have perished in the flames but for their exertions; and to them and the firemen for their prompt services and efficient attention." Had the County fire-office been provided with portable ladders, as all the brigade engine stations are, it is pretty certain that no life would have been lost; as it was, no fire-escapes or ladders, either parochial or others, were forthcoming. The *Times* newspaper, commenting on the catastrophe, said, "In this case two lives were lost by this delay, and those who were so fortunate as to escape, owe their preservation merely to the exertions of their neighbours and the police. The fire-escapes which have been so assiduously puffed, were not to be found, and not even a ladder could be procured, when even such aid would have been

quite sufficient. Surely this should not happen in such a city as London."

Within three weeks after this, viz., on the 7th of June, another fatal fire took place in the house of Mr. Price, in Ivy-lane, Newgate-street. It appeared that two of the City police first detected the smell of fire, but instead of sending off immediately for proper assistance, passed up Ivy-lane into Newgate-street, searching as they went. In the mean time the fire was discovered to be burning in Mr. Price's shop by a casual passer by, who instantly raised an alarm. Mr. Sinfield, with his wife and child, who slept in the second-floor front room, on being roused opened his door to go down stairs, but was in a moment met by an ascending column of smoke and heated air which burnt his eyebrows and whiskers. He then threw up the front window, and the two policemen having returned to the spot, one of them (Serjeant Morris) took off his great coat, and directed those above to jump out. Mr. Sinfield first threw out his child which was safely caught in the coat; he then got out and stood on a projecting ledge of brick-work beneath the window, to which he subsequently hung by his hands, breaking the first floor windows with his feet, upon the frame of which he rested for a minute, then dropped, and was caught in the coat. His wife next followed his example, but fell first on the top of the shop front, and then into the coat. An apprentice, 17 years of age, slept in the second floor back room with three of Mr. Price's sons, the eldest of whom roused him on discovering the fire. The three children ran up stairs screaming to the back attic, where their father slept; the apprentice followed them, but went into the front room; as he ran up stairs the smoke was so hot as to scorch him. On getting into the front room he opened the window and got on to the parapet, from whence he was taken into an adjoining house. Mr. and Mrs. Price with two children, one four years old the other two, slept in the back attic, in which there was a trap-door communicating with the roof; on being roused from his slumbers, Mr. Price succeeded in getting through the trap-door, and his youngest child was handed up to him by his wife. It is supposed that Mrs. Price was in the act of handing up the second child, when the three boys from below entered the room, and unfortunately neglected to close the door, which allowed the heated air to rush in and they were all overpowered, and instantly suffocated. Mr. Price was overpowered by the hot smoke rising through the trap-door, and was only roused by the approaching flames, he then crawled over the roofs of three or four houses and was taken in by a neighbour. As soon as the firemen had extinguished the fire, the remains of some human beings were discovered dangling between some of the burnt rafters of the upper portion of the building; these were the bodies of three children, and from the position in which they were found, it was evident they perished embracing each other. Soon after, the body of their unfortunate mother was found among the ruins in the basement of the building, with the remains of the other child clinging to her breast.

The coroner's inquest brought in a verdict, "that the unfortunate deceased persons were burnt to death at the late fire at Ivy-lane, but how such fire originated there was no evidence to show." Considerable discussion took place at the inquest, on the non-attendance of the parish fire-ladders, which were proved to be very cumbersome, not easily accessible, and wholly unfit for the purpose. An improper delay of fifteen minutes, was also allowed to elapse between the discovery of the fire, and the alarm being given at Watling-street (the nearest) engine station. With respect to fire-escapes, however, the unfortunate family had the *best of escapes*, viz. an easy access to the roof from their chamber, by which they would all doubtless have escaped had the entrance of the smoke been prevented by closing the fatal door. Had the police been provided, as they should have been, with some suitable means of assistance, the rescue of Mr. Sinfield and his family might have been effected much more pleasantly and with much less danger. As it was their exertions were highly creditable to them.

Nine days after this, that is, on the 16th June, at the tremendous conflagration which is supposed to have began at St. Andrew's Wharf, Wapping, another loss of life occurred, and it was almost a miracle that there were not three sufferers, instead of one. When the fire was first discovered, it was rag-

ng furiously in the wharf, and also in the house of Mr. Dark, a baker. In a few minutes two females in their night clothes appeared on the roof, calling for assistance. Coats were held out, and directions given to the girls to throw themselves down, but they did not comply; the flames were fast approaching them, and they made an ineffectual effort to climb up to the next building, which was much higher than the one they were on. Mr. Holliday, a neighbour, seeing this, ascended to the roof of the next house and drew them up, and they were conveyed in a state of insensibility to a place of safety. They were the servants of Mr. Reynolds; one of them had her hands slightly burnt, the other's were much bruised. Mr. Francis Hewson, nephew and principal clerk to Mr. Reynolds, the proprietor of the wharf, also slept in the house. He was aroused by the workmen, who told him the house was on fire; he got up, and hastened down stairs, but while endeavouring to save his Uncle's books his retreat was cut off by the advancing flames, and he perished. His body was afterwards dug out of the ruins, and a coroner's inquest held, when a verdict the same as in the former instance was returned.

The next fatal fire occurred on the 12th of September, at the well known public-house the "Jacob's Well," in Milton-street, Fore-street, in the occupation of Mr. William Vanderstein. About a quarter past one, as the police constable on duty in Milton-street was passing the house, his attention was directed by some passers by to a strong light which was visible through the fanlight of the shop-door. There being neither knocker nor bell to the house, the policeman drew his staff and knocked loudly at the door, when a loud crashing of glass drew his attention to the back of the premises, which he reached by running up Phillips's-court. Here he found the flames pouring forth from a large skylight over a parlour attached to the back of the premises. An alarm was instantly raised throughout the neighbourhood, and within five or six minutes a party of the city police from the Cripplegate station-house arrived on the spot, up to which time none of the inmates of the "Jacob's Well" had been seen. The police most imprudently broke open the shop doors, when the fire was found raging from the bar backwards, and from the draught now afforded, burnt upwards with tenfold fury. The inmates at the time were Mr. Vanderstein, J. W. Blake the pot boy, Jane Gross the bar-maid, and Mr. Thomas Newman, a lodger, the two latter of whom perished. Mr. Vanderstein slept in the second-floor front, and the bar-maid in the back room; the pot-boy in the third-floor front, and Mr. Newman in the back room on the same floor. Mr. Vanderstein stated, that he and his lodger retired to bed about twenty minutes before one, leaving all below, as he thought, perfectly safe; he had got into bed and was nearly asleep when he was awoke by a little dog which was at his bed room door. Having got up, he gave an alarm to the other inmates, and made his escape to the roof of the house, from whence he was rescued by means of ladders subsequently brought from the builder's workshops of Mr. Mackenzie, in Star-court. The pot-boy was awoke by his master calling "Tom," to Mr. Newman; he jumped out of bed, opened his door, and saw flashes of fire on the staircase. After vainly endeavouring to arouse Mr. Newman, whose door was bolted inside, he was compelled to escape by the parapet. The brigade engines from Whitecross-street and other stations were on the spot and at work within a few minutes, and soon succeeded in extinguishing the flames. The damage done to the premises was less than might have been expected; the back part of the house and a small part of the roof was destroyed, but most of the floors were standing. On entering the second-floor front room, which was but slightly injured, the firemen found the body of the bar-maid in her night clothes, with her legs bent upon Mr. Vanderstein's bed, and her head "crooked" underneath the bedstead. The upper part of her body was enveloped in a blanket and sheet; her feet and legs only were slightly burned, and it was quite evident she had died from suffocation. She had undressed in her own room, but had not entered her bed. The body of Newman was found on the third-floor, at the door of the pot-boy's room.

Upon investigating the circumstances connected with this melancholy catastrophe before the Coroner, it appeared that the keys of the parish fire-ladders,

which are kept at Cripplegate Church, were hung up in the police station adjoining; nevertheless, the party of police proceeded to the fire empty-handed, and it turned out that in the printed regulations issued to the police for their guidance in case of fire, they were merely "to raise an alarm, to send to the station and engine houses, and to the turncock of the district." Several of the jury expressed their opinion that the regulations were extremely defective, as they held out *no protection for life*, which was of far greater importance than property. The foreman of the jury strongly censured the police for resorting to the dangerous practice of breaking open the lower part of the building before the arrival of the fire-engines, which greatly increased the current of air, and, consequently, the danger of the inmates. The jury ultimately agreed to the following verdict:—"Burned by the house taking fire; but that there was no evidence how the fire originated; and the jury are of opinion that the loss of life *might have been prevented if fire-ladders or fire-escapes had been at hand.*"

On the 14th of December, Chelsea was the scene of a most destructive and fatal fire. At half past two o'clock in the morning, a fire was found by the police to be raging most furiously in the lower part of the extensive premises, long known as the White Horse, public house, in Church-street, Chelsea. It stood on the west side of Church-street, nearly opposite the church, and was composed of timber work and plaster, with a heavy tiled roof. On the front extended three long windows, divided into many lights by transoms and mullions, and glazed in quarries. Its entrance was embellished with two grotesque brackets, formed of figures representing satyrs wearing turbans; and here for many a live long day,

> "They kept their impious turbans on without
> Good morrow to the sun."

The rearward of the premises was embellished with two large carved figures, particularly curious; one representing a female satyr with a bag-pipe, the other being a grotesque figure with wings.

A gateway led into a court-yard which had at one time buildings connected with the inn, extending round it.

A sign of a white horse, in an ornamented carved frame, hung over the front entrance bearing the date of 1509, but we may safely date the erection at about 1560.*

On the discovery of the fire the attention of the bystanders was directed to the preservation of the inmates; in a few minutes Mr. Bale, the landlord of the house appeared at one of the first-floor windows, from whence he dropped safely into the street. Mrs. Winter, the late landlady of the premises, who was staying there, followed Mr. Bale's example, but with less success, receiving some severe injuries from her fall. A Mrs. Whitehall next appeared at the adjacent window with three children, which she dropped to those below; and then descended herself in safety. Two young men named Hall and Burchell next emerged from one of the upper windows and got on to the sign-board, from which they were ultimately rescued by ladders brought from the premises of Mr. Davis, a builder. The fire-ladders kept under the church directly opposite were found chained and locked, and totally unavailable at this crisis. The engines were promptly on the spot and in full operation, and being judiciously placed, a powerful stream of water was poured in all directions upon the furious element, and by five o'clock the fire was extinguished. By this time it became known that Mr. James Bale, a young man 25 years of age, who had come on the previous evening to visit his brother (the landlord) had perished in the flames. On searching the ruins the firemen soon found his mutilated remains. Mr. James Hall, who was in bed with the unfortunate deceased in one of the top rooms, states that he had just dropped into his first sleep when he was awoke by the deceased calling out fire, when he jumped out of bed and ran down stairs; the smoke was, however, so dense that he could get no farther than the landing of the first-floor, where he ran against some person, which proved to be Mr. Burchell, they returned up stairs, and got out at the front window on to the sign-board. From the state of alarm in which Mr. Hall was at the time, he did not know whether the deceased (who was intoxicated when he retired to rest) fol-

* A very interesting account of this "ancient hostelrie," with engravings of the front and back of the premises, may be found in No. 1043, of the *Mirror*.

lowed him or not, or whether he ever got out of bed. At the coroner's inquest, the police constable who was the first person at the outside of the house after the discovery of the fire, stated, that it then appeared to be in the tap-room, but in less than five minutes it extended to the bar and parlour, and all over the house. He caught the inmates as they descended from the windows, and *had not the parish ladders, which were opposite, been chained up, the deceased's life might have been saved!* There was also a delay in getting out the parish engine, as the key of the gate could not be found. The jury strongly commented on the delay in getting the parish ladders, and in the absence of other evidence, returned a verdict, "That the deceased was accidentally burned in a fire, which occured at the sign of the White Horse in Church-street, but how it was occasioned there was no evidence to show."

Of the remaining fatal fires, one was on the 29th of July, when a man was killed, and two other persons seriously burnt, by an explosion of composition at Messrs. Graham and Davis' lucifer-match manufactory, Primrose-street, Bishopgate-street. Another, August 10, at Mrs. McCarthy's dwelling house, No. 6, Field-lane, Holborn, when a back room on the second floor, occupied by Mary Campbell, a married woman, aged 50, was wilfully fired, by the introduction of a lighted match through an aperture in the partition, which set fire to some linen hanging on a line. The occupier of the room, on the first alarm of fire, jumped out of the window into the yard, although assured there was no danger; she broke her left ancle, which ultimately caused her death in St. Bartholomew's Hospital, whither she was taken.

December 26, at the fire which occurred at the sugar refinery of Messrs. Goodhart and Son, in Ratcliffe Highway, Robert Loader, a fireman was buried by the fall of one of the walls, and received such serious injuries, that he expired five days afterwards in Guy's Hospital. Of the remaining fatal fires, five were occasioned by the accidental ignition of bed curtains, and ten from the ignition of wearing apparel upon the person. Of the latter class of accidents, it is dreadful to contemplate the increase. By a return from the City and Liberty of Westminster, it appears that during the last twelve months no less than 103 children have been burnt to death in that district, chiefly owing to their parents leaving them alone in a room with a fire in it. Of this number about four-fifths were girls, and the remainder boys This arises from the difference of the clothing between boys and girls. When the boys have been burnt to death, it has been chiefly owing to wearing pinafores. In a great many of the cases the accidents have occurred from the children getting on a chair to reach something off the mantel-piece, when their clothes easily ignite.

"Within a few months only at this period of the year the number of children falling a sacrifice to fire is truly appalling. Except to persons whose occupation leads them to a personal knowledge of the incalculable number of lives lost in this way, it is hardly known to the public that the evil is so extensive; indeed, though accounts are continually appearing in the newspapers of accidents to children from fire, and of a fatal description, yet, notwithstanding the frequency of these announcements, they only represent *a tithe* of the actual number. The writer of this has frequently known that no fewer than four children's bodies have been lying in one hospital at the same time, awaiting the result of coroners inquests, and the verdict of the jury, in such cases may always be anticipated as "Accidental Death," And yet it is frightful that so many lives should be forfeited from want of proper precautions being taken to preserve them. In almost every instance of this sort, it turns out in evidence that the little sufferers have met with the accidents during the temporary absence of the parents from home, and the ages of these poor children seldom exceed five years, though it often happens that two years have not passed over their heads. The greater number of children, who fall victims to this calamity are generally the offspring of the working and poorer classes of society whose business takes them from their homes, and many of whom are obliged to leave their children without care or protection, while themselves go into the streets to procure the means of subsistence. Now, considering the vast number of charitable institutions with which this "great metropolis" abounds, would it not be very easy to form societies in various parts of it, by which this dreadful sacrifice of human life might in some degree be avoided? "Prevention is better than cure," and therefore it would be a much more worthy object to aid in the prevention of these direful calamities rather than to li-

mit the means merely to rendering assistance when the accidents have occurred, and which assistance in nine cases out of ten proves of no avail. Mr. Wakley, the Coroner, once suggested at an inquest that societies of ladies ought to be formed in the poor neighbourhoods about town, to furnish those persons, whose necessities required them, with fire guards, so that when they were obliged to leave their children alone, these might afford them security from danger; for although the article itself may be of trivial cost, yet how many are there to whom such a thing is entirely beyond reach. This suggestion is a valuable one, and we think only requires to be known to be acted upon, and when we reflect upon the readiness with which the "softer sex" come forward in the cause of humanity to alleviate the wants of the poor it almost leads us to feel confident that the attention of some of our fair friends need only be directed to the subject to ensure it a favourable consideration, as being the likely means, at least, to decrease the frightful number of innocent children who are thus annually hurried into eternity."*

The want of water, as already noticed, has been severely felt on several occasions of fire; it has most frequently arisen from the turncock not having been called in proper time, rather than from any neglect or want of alacrity on the part of this functionary, or from any want of capability on the part of the water companies to supply a quantity equal to all ordinary emergencies. At large fires, it sometimes happens, that from the circumstance of a number of powerful engines working around one spot, a local deficiency arises. The greatest mischief, however, ensues from the absence of water enough to supply the first one or two engines on their arrival, for which a very moderate quantity would suffice, and the presence of which would—and continually does—supersede the necessity of any farther quantity. Neither the public, nor their paid servants the police, take a right view of this subject, nor can they be made to understand the paramount importance of the earliest intelligence of the out-break of a fire being given to the turncock of the district. At three fires within the last six months near my own residence, two of them very serious ones, the turncock of the district knew nothing of the fires until four and twenty hours after their occurrence! A very serious delay often occurs in finding the plugs, even when the water is turned on; arising from the want of marks against the houses opposite to which the plugs are situated, the neglect to supply which marks, exposes the churchwardens of parishes to a penalty of ten pounds—one half going to the informer. Oh! that the common informers would take up this trade—a rich harvest awaits them! And great public good would result from their labours. A little more liberality on the part of magistrates and parochial officers, in the apportioning of the legislative rewards, both to *turncocks* and *firemen*, whenever they have exhibited great promptitude, and withholding them upon any occasion where culpable neglect was proven, would operate most beneficially for the public weal. The present miserable practice of cutting down the rewards to the lowest possible amount upon all occasions, or the still more absurd and reprehensible custom of increasing the rewards in proportion to the extent of damage done by the fire,* cannot be too strongly reprobated. These rewards are almost universally regarded as a tax, or penalty upon the public, which should be reduced to the smallest possible sum; instead of regarding them, as they were intended to be by the legislature — rewards for promptitude and exertion, and stimulants to emulation and zeal. The false economy, that too often regulates these matters, actually converts that, which was intended to encourage alacrity and attention, into a premium for apathy and neglect.

In consequence of the truly distressing circumstances attending some of the fatal fires, and the manifest deficiency of practical methods of averting the recurrence of unnumbered catastrophes of a similar kind, public attention has during the past year been a good deal directed to the consideration of the subject of escape from fire. The expense of maintaining an efficient establishment

* From the *Dispatch*, December 13, 1840.

* In the event of a fire breaking out in a room, and the prompt attendance of the firemen confining it to that limit, magistrates frequently award the bringers of the three first engines, 10s., 5s., and 2s. 6d. respectively; with 2s. 6d. to the turncock. But let the firemen be a little later, and the water later still, so that the house is fairly burnt down, then these same sapient functionaries will award the full parliamentary allowance of 30s., 20s., and 10s. to the firemen bringing the three first engines, and 10s. to the turncock!

for the sole purpose of protecting life from fire would be so enormous, that the idea has scarcely even been entertained. The police have rather been looked to as the body by whom assistance should be rendered upon such occasions; and when we look back upon the exertions they have successfully made, and the large number of persons they have rescued within the last few years—wholly destitute as they have been of all mechanical aids and appliances—there is good reason to believe, that if provided with some simple and easily applied means of communicating with the upper floors of houses, comparatively few fatal fires would occur.

When the new system of day and night police was about to be introduced into the city, it appeared to me to offer an eligible opportunity for annexing to the accustomed duties of this force, some provision for affording every possible protection to lives and property, against fire as well as thieves. Finding, however, that at that time the attention of the city authorities was fully occupied in remodelling this force, and in regulating and arranging the more essential ordinary routine duties, I forbore to press the subject upon their attention beyond a communication embodying some crude suggestions, which appeared in the *Mechanics' Magazine* for the 7th of April, 1838. In the course of last spring the new system was in full and efficient operation, and worked so admirably, that I flattered myself the time was at length arrived when the subject of fire prevention might be conveniently and advantageously taken up. Under this conviction, on the 7th of May, I addressed a communication to D. W. Harvey, Esq., Chief Commissioner of the City Police, calling his attention to the extreme importance and advantage of providing the police with some means of rendering prompt and effectual aid in case of fire—suggesting certain apparatus as being well adapted for this purpose—and offering to assist in carrying out any such plan.

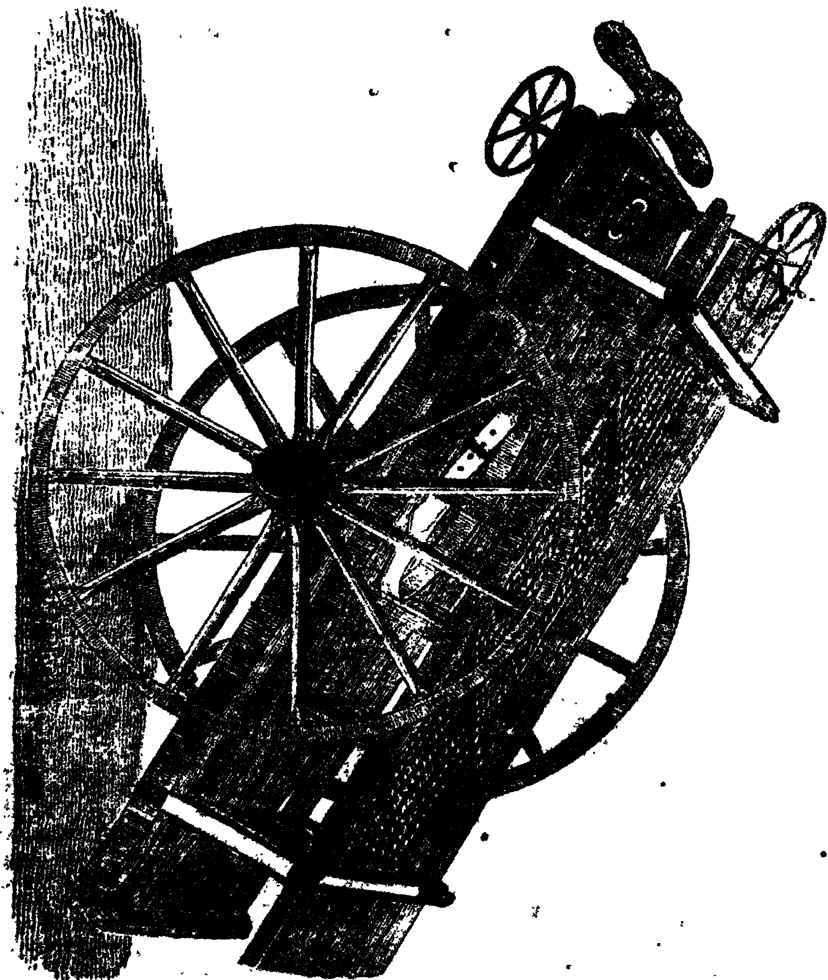
The receipt of this communication was *not* acknowledged; but on the 14th of May, just one week afterwards, the truly melancholy event occurred in Ivy-lane, which I have already fully detailed. Upon this, I wrote the Police Commissioner requesting to be informed if he had received my communication, and after the lapse of another week was favoured with a reply, informing me that both my letters had been duly received, and concluding by stating that the "city authorities were *not disposed to entertain my suggestions*."

Feeling that I had no right to consider either the mode of dealing with my correspondence, or the reply thereto, satisfactory, I addressed myself to the Lord Mayor, enclosing for his lordship's perusal an extract from my communication to the Police Commissioner, embodying my suggestions. This letter his lordship was pleased to insert in the London papers, from which it was copied into the *Mechanics' Magazine** and elsewhere. Close upon this transaction a petition was presented to the Court of Common Council by Mr. B. Steill,† complaining of the utter inefficiency of the city police in case of fire, and calling upon the Court to put them at once on such a footing as would enable them to cope with these calamities. Mr. Lott, and other Common Councilmen, supported the prayer of this petition, and urged the absolute necessity of making proper provision for such cases. The question, after much opposition, was ultimately referred to the Police Committee for consideration. Accordingly, the committee held several meetings at Guildhall, and summoned before them a number of persons who were known to have suggestions to make, or inventions to exhibit. Of this number I was not one, although I was the very first to agitate the measure, and professed to be in possession of certain practical information on the subject, as one to which my attention had been directed for many years. Happening to hear one evening that such a meeting was to take place on the morrow, I took care to be there, and exhibited and explained to the committee the apparatus which I had recommended in my letter to the Police Commissioner, who, being present at the meeting, produced and eulogised my communication descriptive of the apparatus I was then exhibiting, and handed it over to the committee to be added to their other documents connected with that business. Not being personally known to any member of the committee, the system of exclusion most pertinaciously pursued towards me throughout,

* Vol. xxxiii, page 116.
† Ibid., page 110.

has been somewhat remarkable; whether it originated in the first instance in oversight—from hostility towards me as the first mover in this obnoxious business—or from the effects of external sinister influence, I neither know nor care, not being personally interested in the matter. None of the measures that have emanated from the committee have manifested such a superabundance of wisdom, as to warrant them in despising talents even of the humblest order, when such were available. They eventually handed the subject over to their Police Commissioner and Mr. Braidwood, who made a report, which appeared at page 427 of your last volume, recommending the adoption of the portable fire-escape ladders which I had exhibited to the committee, as also the sliding ladders of Mr. John Gregory.

The following is a representation of the



first set of fire-escape ladders completed for the City Police by Mr. Merryweather, of Long Acre, which, it will be seen, are very compactly stowed upon a two-

wheeled carriage, as recommended by me in the *Mechanics' Magazine*, for November 4th, 1837. The top ladder is fitted with a pair of small wheels to facilitate the raising, as also a safety belt which lies within, and is attached to the rope by a spring catch, so as to be exchanged, if needful, for a canvass bag or cradle carried beneath the ladders. Four iron uprights rise in pairs, on either side on the fore and after part of the carriage, between which the ladders are stowed edgeways; a cross-bar jointed to one of each of the uprights comes down upon the top of the ladders and holds them tightly, being secured to the second upright by a turn-buckle. These irons are all leathered to prevent chafing. A small drag handle in front, slides under the carriage bed, so as not increase the length of the machine when standing; when the handle is drawn out, a spring rises and secures it in the extended form; on depressing this spring the handle can again be returned beneath the carriage. A crow-bar and a mattock placed beneath the carriage complete its equipment.

Gregory's sliding ladders are being manufactured by Mr. Tilley, of Blackfriars-road; the inventor's interest in these machines having been purchased, at a premium of five pounds each.

Immediately after the fatal fire at Mr. Clark's in Marylebone-street, the inhabitants of St. James's, Westminster, had several meetings, and formed a local association for preventing the recurrence of such accidents; they purchased one of Wivell's fire-escapes, which is stationed in Piccadilly. It is an error, however, (I hope it will not prove a fatal one) to suppose it possible, that so large a parish can be efficiently protected by any *one* escape.

The following London parishes have adopted one or more sets of Merryweather's fire-escape ladders:—viz.

Allhallows, St. Alphage, St. Andrews, St. Clements Danes, St. Edmund the King and Martyr, St. Katharine Coleman, St. Leonard, St. Martins, St. Mary Islington, St. Mary Abbots, St. Pancras, St. Sepulchre, City, St. Sepulchre, Middlesex; and nearly an equal number have been provided by various noblemen and gentlemen for the protection of their respective neighbourhoods.

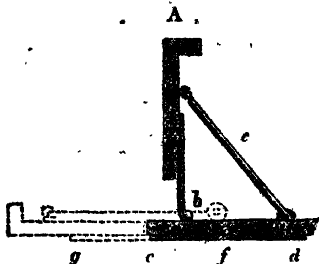
At the beginning of last year a new fire engine of increased power was added to the establishment, and attached to the head station in Watling-street; it has two eight-inch barrels, and was first brought into action at Messrs. Brandram's fire at Deptford (May 3rd), where it proved eminently useful, as it has also done on many subsequent occasions. When it has been expedient to apply a larger column of water than could be thrown by the ordinary engines, two of them have been coupled together and worked out of one branch pipe, by which means a powerful jet has been obtained, compensating for the absence of such powerful engines as are employed at Belfast, Liverpool, Manchester, &c.

The floating engine hitherto moored off Rotherhithe having become dilapidated and inefficient from its great age; it has been broken up and replaced with the new one described at page 313 of your 28th volume. In place of the latter, a new one has been built for the Southwark-bridge station, two views of which are given on the front page of this number, the one sketched from Bankside, the other from the bridge.*

It consists of a fine iron boat, 70 feet long and 14 feet wide, built by Messrs. Ditchburn and Mare, of Blackwall. There are two distinct engines, each having two nine-inch barrels, with the levers so pierced as to make 8, 10, or 12-inch strokes at pleasure; the delivery mains both communicate with a slide cock, and then branch off to two elbows upon deck; so that either one or both of the engines can be worked separately, or the two can be worked together through one hose. The main shafts run parallel with the sides of the boat, each being supported upon five substantial cast iron standards; the handles lying in the same direction, leave a convenient passage in the middle of the deck, and turn up at each end, so as to leave free passages around them when not in use. To afford room to work the engines, the thwarts on either side can be let down, and are supported by an ingenious contrivance, which originated with Mr. J. Kitchin (at that time belonging to the Watling-street station, but now superintendant of fire engines at Port Louis,

* Two gangways running along above the engines are omitted, in order to avoid confusion.

in the Mauritius). In the accompany-



ing engraving A is a section of one of the thwarts hinged to the deck at *b*; *c d* is an iron stay moving within an iron slide partly sunk in the deck, from which an eye rises and is connected to another eye fixed to the thwart by the bar *e*. On withdrawing the bolts by which the thwarts are kept up, they fall into the position shown by the dotted lines *a b*; the iron stay being drawn out, by its connection with the thwarts, from *f* to *g*, forms a firm support for the thwarts to lie on.* When the thwarts are raised, the stays slide back again into their sheaths, leaving the sides of the boat clear of all projections. On the inner edges of the thwarts are row-locks for 24 oars, the rowers sitting in scuttles made in the deck; the steering is effected by a rudder at the stern, which is round. There are three water-tight iron bulk heads, so that in case of any accident its effects will be confined to one quarter of the vessel. Within a house at the stern of the boat there is a hose-reel, carrying a large quantity of leather hose in lengths joined up ready to be instantly run out. A larger house in the bow of the boat, fitted with a small stove, serves to shelter the firemen on duty, and also as a depository for the branches, nose-pipes, coupling screws, and other implements completing the equipment of this engine. The working compliment is 120 men, that is, 30 at each each of the handles. This engine was first tried at Blackwall, on the 20th August, and on the 27th was brought to bear upon the conflagration at Hore's wharf, as stated at page 272 of vol. 33, and was again most opportunely employed at Mr. Rosling's fire, October 19th. It is a noble machine, and reflects great credit upon the designer (Mr. Braidwood), the builders, and the engineer; the workmanship throughout, is of the most substantial character.

While thus expressing a well deserved acknowledgment of the power and excellence of this engine, I beg it to be understood most distinctly, that the opinion I have hitherto expressed of the superiority of a different system of propulsion and of working remains unaltered. Mr. Braidwood still prefers the reciprocating vertical motion, and in this preference he is supported by the opinion of Mr. Walker, the much respected president of the Institute of Civil Engineers; an authority from which it might be considered presumptuous in me to dissent, were it not that the views I entertain upon the subject are in accordance with the results of numerous experiments by some of our most talented engineers—in some of which the power developed by men working at winches, both for long and short periods, has been most astounding. Now unless it can be shown that an absolute loss of power results from the application of manual power to rotation, no one will, I apprehend, for a moment question the superiority of the uniform and equable motion of the crank-worked piston—the difference in the performance of which, as compared with those of percussive pistons, is very striking. The additional opportunities I have had of carefully and impartially observing the working of both class of engines, strongly confirm the impressions previously suggested. It is, I believe, almost universally admitted, that propulsion by oars is more effective than by paddles—a position which I take to be incontrovertible, under certain circumstances; *i. e.* when the oars are worked by skilful rowers. My proposition to employ the rotation of winches to effect, in the first place, the propulsion of the boat, and afterwards to work the engines, originated in a knowledge of the utter impossibility of collecting a sufficient number of skilful rowers in case of fire. Eighteen good hands have taken the new floating engine at the rate of six miles an hour, and she should never go to fires at any lesser

* The unprotected state of the sides of the boat when the thwarts are down requires to be remedied. Some accidents have already happened, but with no further inconvenience than a momentary immersion of the parties. A *fatal accident* for want of proper precaution, might from the present fashionable system of "swinging deodands," prove exceedingly inconvenient.

speed. But will 18 such hands as can be collected on the first alarm of fire, often in the dead of night, realise this speed? Certainly not. Soon as the gong sounds, hands flock on board, but many of them without skull enough to handle a scull, and therefore not calculated to make much way with long oars;* and the mischief is, that the awkward squad neutralise the powers of the few good men that may chance to be among them. Under the circumstances which always attend the starting of a floating fire engine, the advantages of paddles over oars would be as two to one.

A writer in a late number of the *Inventors' Advocate*, after describing a new and improved floating engine on my plan, which is now building by Mr. Merryweather for the Emperor of Russia, observes—

"The most striking difference between this engine, and the floating engines employed by the London Insurance Companies, consists in the adoption of an improved mode of propulsion. The latter are impelled by long oars, which take up a good deal of time in getting out, lowering the thwarts, placing the men, &c., and are very ineffective for the purpose, from the impossibility of getting together a sufficient number of skilful hands on a sudden alarm of fire. When "under weigh," therefore, and proceeding to a fire, they invariably "drag their slow length along." On reaching the fire much time is again lost, the oars have to be unshipped and stowed away in their proper places, the hatches replaced, the engine handles unlocked, opened out, and made fast; the hose has then to be got out and affixed to the engine, &c. In Mr. Merryweather's improved engine, a pair of paddle-wheels are placed at the sides of the boat, and the handles made to unship, so as to be thrown into gear with either the engine or the paddle-shaft, and are thus promptly available for either purpose. By this simple expedient, no loss of time is incurred. In case of fire, thirty or forty able-bodied men being got on board, the handles are geared with the paddle-wheels, the men commence working, and the boat moves rapidly towards the seat of danger. In this case bodily strength only is required, and this can usually be obtained in abundance, when *skilled labour* is wholly unattainable.

"On reaching the fire, the boat is steered into a suitable berth and stopped, the handles are disconnected from the paddle-shaft and thrown into gear with the engine. Working instantly commences, (the hose, &c., having been attached during the journey,) and within one minute a splendid jet of water is pouring on the burning mass. In travelling a distance of two miles or more, such an engine would beat those of the present construction, by more than half an hour in the time of being brought to bear upon the fire. When it is considered that *timely application* is of far greater moment in these cases, than even a more powerful agent brought up at a later period, we cannot help thinking that the insurance companies have acted unwisely in not availing themselves of the advantages of Mr. Baddeley's contrivance, which, next to *steam*, is the best that can be employed for this purpose. There is also a decided superiority in the working of these rotary engines, over those of the alternating kind; the relative uniformity of motion in all the working parts is highly favourable to the developement of the utmost powers of hydraulic or pneumatic machinery of this description. The supineness or slowness of apprehension on the part of the English, forms a striking contrast to the conduct of foreigners, who are generally quicksighted and *unprejudiced* enough promptly to avail themselves of our most ingenious inventions and our greatest improvements in all kinds of machinery. Mr. Braithwaite's splendid steam fire-engine "the Comet," was built for Prussia—and the finest floating-engine ever constructed in this country is now preparing for Russia."

In May last some alteration took place in the arrangements of the London Fire Establishment; that portion of the metropolis south of the Thames had hitherto been divided into two districts, as stated at page 386, of your 32nd volume. These districts were under the charge of Mr. Edward Bourne, formerly foreman to the Globe Insurance Company, and Mr. Edward Syer, formerly of the Hope and subsequently of the Protector fire-office, both of them extensively known and respected. Both these parties have been pensioned off, and the two districts being united, have been placed in charge of Mr. Henderson, a highly respectable and intelligent fireman, whose exemplary conduct, while engineer at the Watling-street station, marked him as every way worthy of this responsible office, the duties of which he has now for the last eight months discharged with satisfaction to his employers and credit to himself.

It would be unjust to close this report without a few words in commendation of the West of England firemen, under their intelligent and indefatigable foreman, Mr. Connerton.

The brigade engines have each a certain district, beyond which their services are rarely required, but the West of England having but one engine and a small corps of firemen, their services extend all over the metropolis and at times the work comes very heavy upon them. From the same cause, distance operates against their early arrival at many fires in remote parts of the metropolis, and yet the order of their arrival has, upon several occasions, been very remarkable. Prompt in their attendance, zealous, and unwearied in their exertions, this trusty little band have often signalized themselves by their timely and well directed efforts, and have proved invaluable auxiliaries to their more numerous rivals.

The past year has been marked by the death of two firemen of the establishment, viz. J. P. Fenn, sub-engineer of the Southwark-bridge-road station, aged 48, and Robert Loader, senior fireman at Watling-street, aged 26. Fenn, was formerly a fireman in the Alliance fire-office. At the terrific fire at Fenning's Wharf, he was severely bruised by a falling wall, which incapacitated him for some time from doing duty; on becoming convalescent, and resuming active service, almost the first fire he was called upon to attend was in Hanover-street, Rotherhithe, and he had no sooner jumped off the engine, than a wall again overwhelmed him, and he narrowly escaped being killed on the spot. These repeated injuries either laid, or developed the seeds of latent disease, and after lingering two years and a half in a decline, death closed his sufferings in October last. He was a skilful and courageous fireman, and died deeply regretted by the whole establishment. His funeral was conducted with the usual honours.

The melancholy fate of poor Loader has been already noticed; in him the establishment have lost a valuable servant. He was universally regarded as one of their best firemen; he was an excellent penman, an ingenious mechanic, and the best maker of leather hose in the establishment. He fell a victim to his courage and zeal in the service, and was deeply and universally lamented. He was buried with full honours, the melancholy cortege being headed by two foremen, his pall supported by six comrades, his coat and accoutrements lying upon the coffin, and after his mourning relatives, followed all the firemen that could be spared from the several stations, wearing crape on their left arms.

This is the first fatal accident that has occurred since the formation of the Establishment, now a period of eight years, a circumstance that redounds greatly to the credit of Mr. Braidwood, who, while he requires that every possible effort should be made, is at the same time most provident and careful of his men. It is a most praiseworthy trait in his character, that he is upon all occasions far more anxious for their safety than for his own, and frequently exposes himself to risks which he will not allow others to encounter.

The exertions of the firemen have fully kept pace with the increasing number of fires, and though at times they have been hard pressed, their spirits have never flagged—their energies never failed. Upon many occasions, their almost superhuman efforts, have elicited most unqualified praise, and upon one occasion something more substantial; Mr. Rosling having presented those engaged at his well-stopped fire with a donation of ten pounds.

A superintendent of consummate skill, officers of proved talent, brave and skilful men, with machinery of the most perfect and complete description, all combine to render the London Fire Establishment pre-eminently efficient.

Impressed with a grateful sense of the obligations due to the ample protection afforded, and wishing them the same well deserved success which has hitherto marked their career,

I remain, Sir,

Your's respectfully,

WM. BADDELEY.

5, Chester-terrace, Borough-road, Southwark.

PROFESSOR M'GAULEY'S PLAN FOR THE PREVENTION OF RAILWAY ACCIDENTS.

Sir,—A letter from Mr. E. Birch, page 91 of the *Mechanics Magazine* for last month, suggests to me the propriety of remarking, that the contrivance of which you have kindly given a description, page 87, and which is intended for the prevention of railway accidents, was made by me as public as possible in the latter end of last October, and was communicated gratuitously to several Rail-

way Companies, by letters dated *November 2nd*, to which I received answers—viz., from the London and Birmingham Railway Company, a letter *dated November* 4; from the Great Western, one dated *November* 6; and from the Dublin and Kingstown, one dated *November* 9. It is therefore prior to, and unaffected by, a patent taken out *November* 12.

The insertion of this would prevent mistake, and greatly oblige

Your obedient servant,

JAMES W. M'GAULEY.

Office of Education, Feb. 3, 1841.



ON ROTARY AND RECIPROCATING STEAM ENGINES, AND ON THE SUPPOSED LOSS OF POWER FROM THE USE OF THE CRANK.

[Concluded from page 121.]

"1. It was long imagined that the transmission of power through a *crank*, or *bend*, or *handle* in an axle, was attended in the steam engine with great loss of effect. In the opinion of such men as Smeaton, the crank was never likely to be used as the means of obtaining rotary motion from steam; while it is this very crank that is, in our day, used alone and universally over all other methods, although a great variety of other methods have been successively invented, and finally abandoned for the simple elementary crank. Yet it is not without some show of reason, that objections have been made against the practical working of the crank. We admit that the argument was rather a staggering one, but the difficulty has lately been wholly removed.

"The staggering fact, to which we refer, was this: it is given as stated by Dr. Penneck of Penzance, Cornwall, in describing a substitute proposed by him for the crank. 'Some have considered a wheel as one-third more powerful than the crank, and others that no power is lost by the crank, but confining myself to *practical results*, it appears from the report of the duty of steam-engines as done in Cornwall, and published by Messrs. Lean, that the performance of the crank engines bears no proportion to those in which no crank is employed.' He then proceeds to show the advantages of his own engine, in which a ratchet-wheel is moved by an arm, always acting at the extremity of a radius, by which means he hopes to save the loss of power occasioned by the crank. The fact related by Dr. Penneck was perfectly accurate. It had happened that the crank steam-engines, working expansively in Cornwall, had never given out an adequate effect. That the fault did not lie in the crank, but in other parts of the arrangement, is now apparent; it consisted in the want of proper adjustments to admit of favourable action in using the steam expansively. Arrangements for this purpose have, however, been at length accomplished, and crank-engines are now in Cornwall doing the same work as the average of those that have no crank. We have before us the printed reports of last year, stating the duty done by the crank-engines of Charleston and Wheal Kitty, constructed by Mr. Sims. We have also before us indications of the *actual pressure of the steam on the cylinder*, as obtained by a very accurate indicator, applied in the course of the summer of 1837 by Mr. Smith for Mr. Fairbairn of Manchester, who visited the mines for that purpose, and has been kind enough to favour us with a copy of his diagrams and observations. We have thus the means of comparing the power actually exerted on the piston with the work done, and find the result of the comparison to be, that *the work done is within ten per cent of being equal to the power employed.* Here, then we arrive at this conclusion, that the utmost conceivable reach of improvement in the mechanism of the steam-engine, if it even attained to perfection, would not save more than a few per cents. That the crank-engine is, therefore, as at present used, as near in practice to the perfection of mechanism as anything we can hope to obtain, is, we think satisfactorily explained.

"2. The crank, as a means of converting the reciprocation of the piston of a steam-engine into continuous revolving movement, possesses certain singular and beautiful properties which distinguish it from every other means of producing that conversion, and which appear to be so perfectly adapted to the nature of steam and the constitution of solid matter, that we are indebted to it materially, though indirectly, for the very great advantages which we derive from the modern steam-engine as a source of mechanical power. Let us examine into the causes of this well-established practical superiority of the crank to all other modes of producing revolving motion. Let it be observed, that in the reciprocating piston, from which the crank derives its motion, the following things take place: the piston is to be put in motion in one direction, then stopped, then put in motion in the opposite direction, stopped again, and then its motion resumed in the first direction. We shall see how admirably the crank adapts itself to these changes; so that, while the piston with which it is rigidly connected takes every velocity between its maximum velocity and perfect rest, the crank goes forward with a motion perfectly regular and perfectly unimpeded. The necessity of this gradual change from motion to rest, and a reverse direction of

motion, is obvious. Matter in motion acquires momentum and cannot be stopped, but its impetus must be equally and gradually removed, otherwise these moving parts are subjected to concussion as if by the stroke of a hammer, and must either suffer injury or produce it; for when in motion, matter requires a force to stop it equal to the force which gave it that motion. And, on the other hand, when brought to rest, matter cannot instantly be set in motion in the opposite direction without a stroke and concussion equally violent. To work smoothly, durably, profitably, and uniformly, matter must be put in motion by gentle gradations, beginning with a very gentle velocity, and gradually increasing in velocity like a body set in motion down an inclined plane, where, if it move one foot in the first second, it moves three in the next, five in the next, seven in the next, and so on; and in like manner in coming to rest, it must do so in the same gradual way in which an arrow shot from a bow vertically into the air loses its motion; for in the end of its course it moves seven feet in the first quarter of the last second of time, five feet in the next quarter of a second, three feet in the next, and only one foot in the last, and then subsides into rest at the instant before it again recommences motion downward, which it does in a manner perfectly similar. It is required, therefore, that while the motion which the steam gives off by the crank be uniform and continuous, the parts of the engine itself shall be allowed time to be alternately brought into a state of rest, without shock, concussion, or jolt, and equally, gradually, and gently be again urged to their greatest velocity in the opposite direction. All this the crank effects with the most exquisite nicety of adjustment; it stops the piston when in motion as gently and softly as if a cushion of eider were placed to received it; and after having brought it to rest again begins and accelerates its motion, as gradually and gently, to the highest velocity in the opposite direction. An adjustment so perfect is only possible in such a relation as that which subsists between the circle of the crank and the axis of the piston.

Now if we compare this mode of action with any of the substitutes for the crank, by which it has been proposed to gain uniformity of power, we shall find that in these it would be required that the transitions from rest to motion and from motion to rest should be instantaneous; and hence such arrangements, being soon disordered, have been abandoned. It will also be found that in rotatory-engines it is necessary that the transitions and changes of arrangements, where these exist, are necessarily instantaneous, or if not, that steam is lost, or that the boasted uniformity of power is sacrificed.

3. "The next property of the crank, as an elementary machine for the conversion of motion, is its remarkable power of reducing errors of construction, arrangement, and execution. It is one of the highest recommendations of a piece of mechanism that any trivial errors committed in its construction shall not materially injure its efficiency; and that any slight derangement in its adjustment shall not be attended with immediate deterioration or aggravated injury; but that on the other hand, the efficiency of the machine shall be consistent with such degrees of correctness in workmanship, and accuracy in adjustment, and care in making use of it, as are consistent with the ordinary amount of intelligence and attention of ordinary workmen; and that the progress of derangement and necessary tear and wear shall be so gradual as to give timely warning of danger, and admit of ready repair and readjustment. The crank is precisely such a piece of mechanism. Errors in adjustment or construction of valves and other vital mechanism, are diminished in effect by the crank one hundred fold; the changes of the valves, the essential part of the mechanism, take place only at the top and bottom of the stroke. Now at these instants the crank is on 'the line of the centres,' as it is technically called; and it is just in this position that a minimum of force is made to act on the crank, so that if the valves do not open with perfect precision, but either a little too soon or a little too late, then will such error at that part of the circuit be of comparitively trifling consequence, because then the motion of the piston is so slight, that through an arc of twenty degrees of the crank it does not describe the hundredth part of that space: and the effect of any error committed within that range, will not affect the result in the crank by one hundredth part of its full amount.

"In like manner, errors in management and errors arising from wearing, are reduced a hundred-fold in effect by transmission through the crank. It has frequently been to us matter of astonishment, to us to see at the mouths of coal-pits, mines, and quarries, mere remnants of engines, frail rusty old fragments of iron and wood, so loose as scarcely to stand upright upon their bases to see these superannuated drudges still performing heavy work to a very large per centage of their full power.

4. "To these circumstances we may add, that it is to the possession of these properties that we may attribute the fact, that reciprocating engines are constructed of enormous weight in their moving parts, and of ponderous dimensions, without being thereby sensibly deteriorated in working. The crank

acquires a slow motion at the commencement of the stroke, and an accelerated motion is thereby acquired in a manner equally gradual by all parts of the machine; and in like manner, at the termination of the stroke, it brings them to rest again in a gradation so gentle and uniformly retarded, as again to receive from them much of the impetus which it had formerly communicated. The impetus therefore given to the reciprocating parts is only *lent* not *lost*.

"We have thus endeavoured to expose the nature of the fallacy under which they labour who imagine that the present steam-engine, as derived from Watt, is a machine which destroys or absorbs a large portion of the power it is designed to transmit, and who look to the rotatory-engine as a means of increasing the amount of the power given out in useful effect. That the rotatory-engines which appear day after day are not new, we show from the fact, that the five great classes which comprehend them all have already been invented and re-invented by upwards of a hundred individuals. That their inventions have been unsuccessful, is manifest from the non-existence of their machines in the daily use of ordinary manufactures. That the failures of these contrivances did not arise from the defects accidental to peculiar arrangements and contrivances of the engine, is rendered probable by the great variety of forms in which they have been re-invented, tried, and abandoned. That they have not failed from deficiences in the workmanship and practical details, is rendered still more probable by the circumstance of finding among the names of inventors those of the most eminent practical engineers. We have next shown, that in theory, the crank of the steam-engine in common use cannot, as has been supposed, be attended with the loss of power, as such loss would oppose the established doctrine of virtual velocities. It is also shown, from very simple and elementary considerations, that what appears to be lost in force is resumed in velocity; that in proportion as the mean force on the piston is greater than the mean force on the crank, in that proportion is the space described by the latter greater than the space described by the former; that the dynamical effect produced in a given time, is exactly in the proportion of the steam expended in that given time. And thus have we arrived at the conclusion, that the common reciprocating crank steam-engine has not the faults attributed to it in theory, and which the rotatory-engines have been designed to remedy. We have next taken the practical view of the subject. In simplicity of parts, the rotatory-engine has no advantage over the reciprocating piston; in difficulty of construction, the rotatory piston far exceeds the reciprocating-engine: it is far more expensive at the outset—it has more friction—it is more bulky and less compact—it is inferior in precision and uniformity of action to the crank-engine—and there is a radical fault inherent in the very nature of rotatory mechanism, from which it follows that the rotatory-engine can never be rendered either an economical or a durable machine. We have further shown, that even if the rotatory-engine could be made economical and durable, its very nature renders it unsuited to the great purposes of steam navigation and inland locomotion: objects to which it has been considered peculiarly applicable. We deemed it an appropriate and instructive conclusion to our enquiry, to examine into the action of the crank, for the purpose of discovering what those remarkable qualities are which have given to the crank of the common steam-engine its unrivalled superiority as an element for the production of circular motion, and a degree of perfection unattainable by any other mechanism. We have seen that well constructed crank steam-engines are daily performing duty which is within 10 per cent. of the theoretical maximum of possible effect—of absolute perfection; that this practical perfection arises from the simplicity of the crank, from its wonderful adaptation to the nature and laws of matter, and of circular motion in connection with rectilineal motion—from its reduction of errors either in construction, adjustment, or management, so as to work well without the necessity of greater intelligence, expertness, and precision than belong to ordinary workmen—and from the compensating nature of the arrangement of its structure, by which it is accommodated in a remarkable degree to the necessary imperfections of all human mechanism."

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

William Daubney Holmes, of Lambeth-square, Surrey, Civil Engineer, *for certain improvements in steam-engines, and in generating and applying steam as a motive power.* Enrolment Office, February 1, 1841.

In the first place, by these improvements, low pressure steam is converted into high pressure by passing it through one or more chambers to which a greater degree of heat is applied. The steam is supplied to the working cylinder from each of these chambers in succession, each being refilled in succession with low pressure steam to be raised in temperature and then admitted to the cylinder.

Secondly, the power of the steam is to be increased by raising its temperature in the working cylinder. A space is formed between the cylinder and its jacket, which is to be filled with oil or any other fluid which boils only at a high temperature. Heat being applied, the steam is kept at as high pressure, or even higher, than supplied from the boiler.

Thirdly, the patentee proposes to supply steam boilers with water, by means of an intermediate chamber, connected with the water tank and the boiler by suitable pipes and valves. When the boiler requires water, the valves between that and the intermediate chamber are opened, and the chamber becomes filled with steam; these valves are then closed and others opened communicating with the cold water tank, when the steam is instantly condensed and the chamber filled with water; on again reversing the valves, steam enters from the boiler by an upper pipe, while the water runs into the boiler by one placed on a lower level.

Fourthly, it is proposed to supply steam from a low pressure to a high pressure boiler by an arrangement similar to the foregoing.

Fifthly, to employ waste high pressure steam turned into a pipe passing through a low pressure boiler, to increase the temperature of the water and steam contained therein.

Sixthly, to adopt a mode of propulsion by means of fixed ropes; a rope is laid along a railway, road, or canal, and fastened at each end; motion is communicated by steam power to a revolving drum placed on a suitable carriage; the rope being passed two or three times round this drum, the effect of its rotation is to draw the carriage and any others that may be attached to it, along the line of road.

The claim is to, 1. The application of an intermediate chamber to increase the heat and pressure of steam previous to its acting in the cylinder of the engine.

2. Effecting the same object by heating the cylinder externally; the ordinary locomotive cylinder is excepted, being already heated by being placed in the smoke box.

3. Conveying water into a steam boiler by the circulation of steam and water through pipes, cocks, and valves, connected with an intermediate chamber.

4. Charging or supplying steam from a low pressure to a high pressure boiler, as described.

5. Conveying waste steam at a high temperature into a low pressure boiler to increase the temperature of the steam and water therein.

6. The application of steam through the medium of a drum to a rope, chain, band, &c., laid along railways or other roads, and canals, for propelling and hauling carriages and vessels thereon.

THEOPHILUS RICHARDS, OF BIRMINGHAM, MERCHANT, *for certain improvements in cutting or sawing wood.* Petty Bag Office, February 5, 1841.

These improvements consist in the application of certain peculiar machinery to cutting veneers. The wood is attached vertically to an upright frame moved up and down by a rack and pinion, and moved to or from the saw so as to regulate the thickness of the veneer. The saw presents a perfectly flat surface on its front side, but its back part is bevilled off into an inclined plane which throws off the veneer as it is cut. The saw traverses in a sliding frame at the bottom of the wood to be cut, and revolving rapidly, passes through the wood. The saw then recedes, and the wood being lowered the space of another cut, the operation is repeated, *ad lib.* The only novelty in this arrangement, and of that the utility is very questionable, is, moving the saw to the wood, instead of the wood to the saw—bringing the mountain to Mahomet, instead of taking Mahomet to the mountain. The invention is "communicated by a foreigner residing abroad;" should he ever visit London a pilgrimage to the Imperial Saw Mills, described in our 907th number, would doubtless wonderfully enlighten him on these matters.

MILES BERRY, OF CHANCERY LANE, PATENT AGENT, *for certain improvements in the arrangement, construction, and mode of applying certain apparatus for propelling ships and other vessels.* Rolls Chapel Office, February 13, 1841.

The bow, or fore part of the boat, barge, or other vessel, is constructed so as to accommodate the screw or other propellers which are placed there, and which are intended by their particular formation and mode of action, to draw the water directly from the bow, and give it, as it passes towards the stern such a direction as shall greatly diminish the resistance offered to the passage of the boat. In a boat 15 feet wide and 90 feet long, the spiral propellers may be about 7 feet diameter and 12 feet long. These screw propellers have each four spiral wings or threads, one of which is a right, the other a left handed screw, the threads winding at an angle of about 45 degrees. They are made to taper each way from the centre towards the ends; their shafts incline towards each other as they approach the bow, so as to be about 6 feet apart at their fore, and 9 feet apart at their rear ends. Their fore bearings are attached to the guard or bow timbers near the stem of the boat; their after-ends may pass through stuffing-boxes, or be in any other suitable manner connected to the

driving machinery. Instead of using continuous wings on threads to the screw-wheels, the said wings may be divided into segments of five, six, or more inches in width, as has frequently been done in propelling-wheels. The bottom of the boat may be carried forward under the propellers, so that the fore end stands immediately under the prow, and may have such a form given to it, and to the fore part of the boat, as that it shall occupy the space between the propelling-wheels and come as near as may be in contact with the propellers without actually touching them. In canal boats the propellers may be immersed about two-fifths of their diameter under water; in deeper water they may be still more, and in lakes and other waters where the depth is sufficient, they may be entirely submerged.

Although screw propellers are described as best adapted to the purpose of propelling upon this plan, two paddle-wheels may be used instead, in which case the axis of the said paddle-wheels are to be placed so that they will form an obtuse angle with each other, and that the action of the paddles shall be in the line of direction of the shafts of the screw propellers, as before described. The object of thus locating the propelling-wheels, and of so constructing and arranging them as that they shall not act in the direction of, or parallel to, the keel, but outward towards the bilge, as above described, is, that they may withdraw the water from the bows of the vessel and give it a direction which will lessen its retarding action, and carry it most directly to the stern, by which means, it is stated to have been experimentally proved that the water will be left much more smooth and undisturbed than by any other mode of propelling hitherto essayed.

The claim is for the mode described of locating the two propellers in the bow of the boat or vessel, and causing them to act upon the water in a direction inclined from each other, in the manner and for the purpose set forth.

Luke Hebert, of Birmingham, Civil Engineer, *for certain improvements in the manufacture of needles.*—Enrolment Office, Feb. 15, 1841.

A hank of brass, iron, steel, or other metal of sufficient strength, is taken and cut up into lengths of about 30 inches, one half of which is formed into a helical coil by winding it round a suitable pin. Upon the plain part a number of needles are spitted, to the number of from 200 to 400. The wire is of such a size as to pass quite freely through the eyes of the needles. The wire thus filled with needles is supported by two uprights upon a frame furnished with screw forceps, so as to hold them perfectly horizontal. A clamp like a large hinge is made of two cast iron flaps, lined on the inside with hard wood, and furnished with a tightening screw; two slips of leather are cemented along the two upper inner edges of the clamp, so as to form a pad by which the needles will be held. As the needles hang down from the horizontal wire before mentioned, one of these clamps is brought under them, and the upper edges being brought up to the eyes of the needles, the screw is tightened, and they are held fast in an even row. The helical part of the wire is then drawn out so as to be nearly straight, but yet possessing so much of the spiral form as is necessary for the object in view. Six of these clamps are then placed in slides or grooves in a fixed frame, upon the top of which a rectangular cast iron frame slides backward and forward, being driven by a crank and fly wheel: at one end of the frame there are a series of pins or studs, around which one end of the wires is twisted, the other ends being attached to self adjusting tension hooks, of a very ingenious construction. The handle being turned, the crank motion works the sliding frame, drawing the undulating wires backward and forward through the eyes of the needles: these wires being charged with a pasty or semi-fluid composition of putty of tin, or crocus martis and olive oil, smooths and polishes the eyes of the needles, the spiral direction of the wires bringing them regularly in contact with every part of the hole.

The claim is—1. The construction and employment of the machinery described for perfecting the form and polishing the eyes of needles, by drawing wires through them while fixed in a straight or curved line.

2 The use of wires for the above purpose, to which has been given either a helical or undulating figure.

3. In combining with wires either helical or undulating, the use of the composition described, or any other suitable abrading or polishing material or mixture, whether in a fluid, semi-fluid, or dry state.

Pierre Armand Le Comte de Fontainemoreau, of Skinner's-place, Size-lane, Gentleman, *for certain improvements in covering and coating metals and alloys of metals.* Enrolment Office, February 15, 1841.

These improvements relate to an improved mode of covering or coating certain metals or alloys of metals, with gold, silver, or platinum.

Firstly, of gold; this process is particularly applicable to coating or covering copper and its alloys, to silver and its alloys, and to some other alloys more or less alloyed with copper; to iron, tin, bismuth, antimony, and to the several alloys of these metals.

In all cases, the first operation consists in preparing or cleansing the article to be coated or covered, after the workman has given it

the precise form which it is to retain; for this purpose it is heated to redness, and when moderately cooled, is to be quenched in water slightly acidulated with sulphuric acid. A bath is prepared by adding one part (by weight) of sulphuric acid to one part of water and two parts of azotic acid, into which the goods are to be placed. When the articles begin to turn black, they are to be taken out of this bath, and thrown into azotic acid of 30 to 36 degrees of Beaume's areometer, when they will become of a fine bright yellow colour, and are to be washed in fair water and scratch-brushed. The work is then to be burnished in such parts as are to be finished in that way. Silver articles are to be cleaned by heating them, and then throwing them into acidulated water, and letting them remain for three or four hours, or until they become white, when they are to be taken out and scoured with water and fine sand.

A solution of gold is prepared by dissolving pure gold in a finely divided state in brome or chlorine, or in some azote chlorhydric acid, or in some azote iodydric acid; this solution is evaporated to the consistence of syrup.

The operation may then be conducted by any one of the following five methods, which constitute five different modes of gilding, the first being preferred.

First Bath.—Four hundred parts (by weight) of distilled water are to be placed in an enamelled iron pot and made tepid, when 70 parts hydrated oxide of barium, hydrate of barytes, or 70 parts hydrated oxide of strontium, hydrate strontites, are added. When these are dissolved, the gold solution is added, and the whole boiled together; as soon as the mixture begins to turn purple, the articles of copper or its alloys are to be immersed therein. On being taken out they are first dipped in acidulated water, afterwards in fair water, scratch-brushed, and dried off in sawdust. If silver articles are to be gilded, they must be covered with copper wire, otherwise they will not take the gold.

Second Bath.—Common water is to be used instead of the distilled water, with 15 parts by weight of oxide of lithin, to which the solution of gold is to be added, and the operation conducted as before.

Third Bath.—Three parts of gold prepared as before, 1,000 parts water, 125 parts quicklime, or 75 parts of magnesia, besides 25 parts chlorine of calcium, or chlorine of magnesia, are boiled together, and used as before.

Fourth Bath.—Eight parts of gold in solution, 50 to 80 parts of oxide of zinc, 100 parts of water, and 350 parts chlorine of zinc, boiled, &c. as before.

Fifth Bath.—Five parts of gold precipitated by oxide of zinc, 600 parts distilled water, 250 parts chlorine of barium or strontium, zinc, lime, or magnesia, boiled, &c. as before.

Secondly, for coating or covering articles with silver. Ten parts of silver are dissolved in azotic acid, evaporated to dryness, and then re-dissolved in distilled water. Into an enamelled iron-pot put 5000 parts of water, 900 parts of chloride of barium, or of strontium, of lime, magnesia, or zinc; to these add from 1000 to 1400 parts of cream of tartar and boil the mixture; then add the silver solution, with 25 parts boric acid. The articles to be silvered are to be plunged in, and when the coating is strong enough, taken out, washed in tepid water, scratch-brushed and dried.

Thirdly, for coating and covering metals with platinum, a solution of two parts of platinum in azotic acid, chlorhydric, or boric acids; when evaporated nearly to dryness add 10 parts of distilled water, 15 parts chloride of barium, or of strontium, lime, magnesia, or zinc, or chloride of ammonia, and boil them together. The articles are to be immersed till they take a grey coat, they are then to be thrown into water, well washed, scratch-brushed, and dried.

The claim is, 1. The use of the substances named in the first mentioned process, for coating and covering metals and alloys with gold, as well as all the salts of their bases, either alone or combined with other substances; the substances being barytes, strontites, lithin, lime, magnesia, and their salts.

2. In the process for coating and covering with silver, the chlorines of barium, barytes of sodium, of strontium, strontites of lime, of magnesia and of zinc, either alone or mixed with other substances; and the mode of operating with them.

3. In the process of coating and covering with platinum, the use of double chlorines of platinum and of barium, barytes of strontium, strontites of magnesia, lime, ammonia and zinc, alone or combined. Also the oxides and salts of these bases, either alone or combined with the salts or oxides of platinum.

SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—Until Mr. Howard furnish me with the name of the Director (with whom he had the extraordinary communication,) I decline taking any further notice of Mr. Howard or his assertions.

I am, Sir, your most obedient servant,

WM. SYMINGTON.

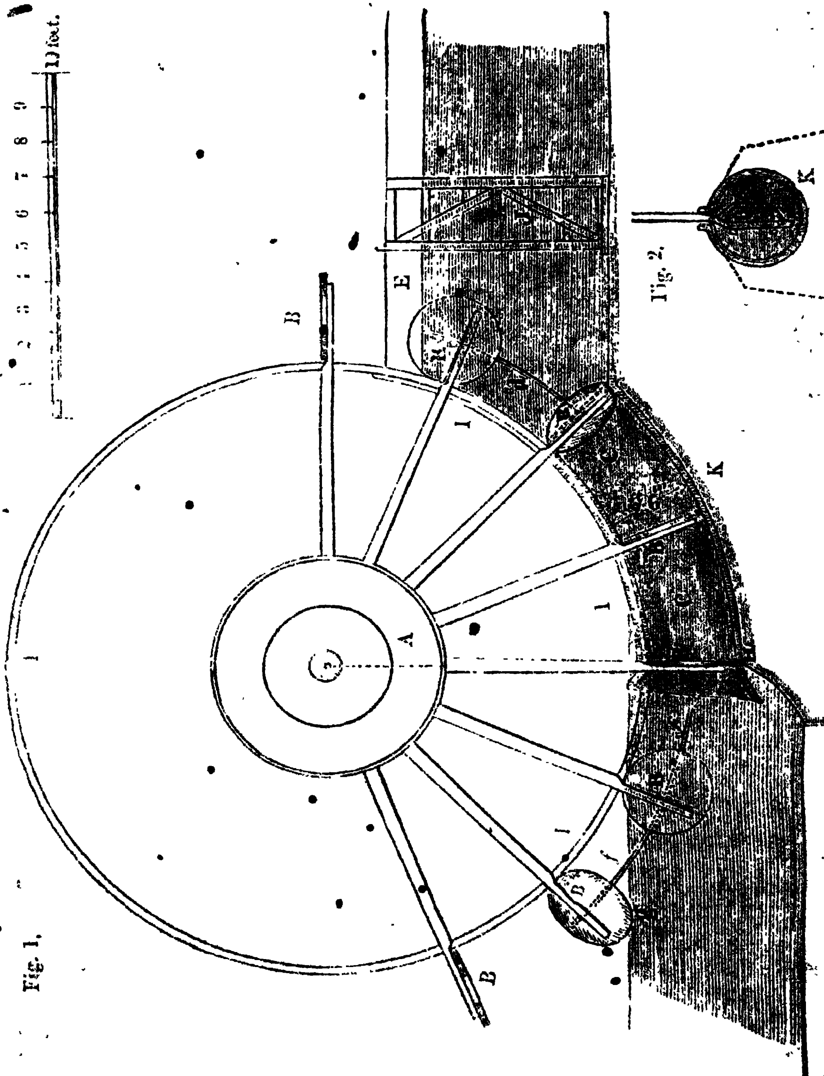
Wangye House, Essex, Feb. 3, 1841.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; and W. Campbell and Co., Hamburgh.

Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 916.] SATURDAY, FEBRUARY 27, 1841. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.



IMPROVED DRAINAGE WATER WHEEL.

Sir,—I have sent the accompanying drawing, thinking you might deem it of sufficient merit to find a place in your excellent journal. It represents, as you will perceive, a new method of lifting water to a limited height; therefore it is well adapted for the purposes of draining fens, &c.

The water wheels used at the present day for draining fen districts are not at all times effectual; as in cases of flood, when they ought to have their greatest effect, they are rendered in many instances almost useless.

The water wheel I now submit to the inspection of your numerous and intelligent readers would, in my humble opinion, prove in times of flood far more efficient than those in present use, as a rise of head water against the wheel will not resist its discharge of water in the same ratio as it does the wheels now in vogue.

Various have been the attempts to supplant the present mode of drainage by one more competent: Hall's Hydraulic Belt has been experimented with, and has been asserted to surpass the present mode; but every one who is acquainted with the hydraulic power of the water wheel will at once see the incompetency of the Belt to compete with it.

This wheel will undoubtedly allow of greater improvement, and perhaps some of your ingenious correspondents who are acquainted with the present mode of drainage, will point out its defects and impracticability, and why it might not answer the means of draining with more economy, by doing which they will confer a great favour upon.

Your obliged servant,
JOSIAH HUMAN.

Ely, January, 1841.

Description of Engraving.

A is a wheel constructed of wood or iron, part of which is shown; at the extremity of each arm, placed at equal distances, are attached circular float boards B, B, B, made to fit with tolerable accuracy in the barrel C, which may be made of wood or iron—the latter probably would answer better. The boards B, B, B are not fixtures upon the arms of the wheel, but hung upon suitable joints or hinges, to allow their taking different positions when required, which is effected by passing a bar *d*, placed near the arms of the wheel, and continued to the surface of head water E, so that the float boards on arriving at the end of the barrel, and after having discharged the water, are turned edgeways, until they reach the surface of water E. A bar F is similarly placed behind the barrel, to ensure the boards keeping edgeways on entering the tail water at *g*, but are allowed to turn in a facing position on entering the barrel at H. The wheel turning, and carrying with it the float boards through the barrel C, they act as pistons, and force the water up into the head. The strengthening segments I, I, I on the wheel prevent the water escaping at the opening of the barrel, through which the arms of the wheel pass (see the transverse section, fig. 2), and by continuing a similar opening to the top of the water for the arms to pass, prevent the head water escaping back into the drain through such opening. The barrel to be firmly fixed in brickwork at K. J a pair of doors with pointing sills.

The speed of the wheel must be so regulated as to allow the water partly to fill the barrel before the following piston or float board enters.

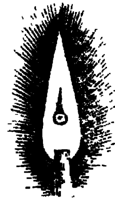
Steam or wind engines might be used as the primary mover, motion being conveyed to the wheel, by a pinion working in toothed segments, as used on the present wheels for the drainage of fens, &c. &c.

BLOW PIPES. — PASSAGE OF FLAME THROUGH RETICULATED BODIES.

Sir,—Being interested in the proposal of Mr. Kegg, in your number for January, in order to the discovery of some means to render the oxy-hydrogen blowpipe secure from explosion, I wish to enquire of your numerous correspondents if the use of the safety cylinder, stuffed with sponge, proposed originally I believe in your miscellany for July 1827, has not effected the desired object. Your esteemed correspondents Messrs. Roberts and Baddeley appear to think that any material which is not a good conductor of heat is usless for the above purpose, and explain the action of wire-gauze in preventing the passage of

flame from the cooling power of the metal which indeed is the explanation usually given. This opinion is in contradiction, I think, to the facts elicited by Mr. John Murray, that canvass or any similar texture is equally efficacious in preventing the passage of flame if exposed to its influence only so long as not to ignite or injure the substance employed. The experiment of the metallic ring extinguishing the small flame of a thread dipped in oil, in which your correspondents, as well as in other particulars so singularly coincide, will be found equally to succeed when wood, stone, or any non-conducting material is made use of instead of a *metallic* ring, and the ring will also extinguish the flame quite as well when red hot, with the precaution of heating it just below the point of ignition of the oil gas—thus leading, I venture to think, to the supposition that some other cause than mere cooling must operate to produce such effects. Mr. Roberts also details the interesting experiment of supporting wire-gauze in the flame of a candle or gas light until red hot, when the gases which passed unconsumed through the gauze are ignited on its upper surface (though I am not sure that an ordinary flame would produce that result) and explains this, as is generally done, by supposing that the wire-gauze when made red hot, no longer exercises sufficient cooling influence on the flame and therefore permits its passage through the interstices of the gauze. Yet I presume to imagine this explanation is not sufficiently accurate; I rather think the heated wire itself communicates the inflammation to the gases passing unconsumed through the wire-gauze and in contact with its upper surface. This opinion is strengthened by the fact also mentioned by Mr. Murray, and which can be demonstrated by experiment, that when the gauze of the Davy lamp is heated to a dull-red in the fire-damp of the mines, such a state is rather beneficial than otherwise in preventing explosion, which does not ensue from that cause until the wire-gauze is heated to a considerably higher temperature, or as I suppose, to the point of ignition of carburetted hydrogen gas.

I do not wish to be understood as affirming that flame does not pass through wire-gauze in certain circumstances, as it is well known to do when the Davy lamp comes in contact with a strong *blower* from the coal, as was demonstrated by Mr. Pereira before a committee of the House of Commons; but I mean that when the passage of such flame is prevented, it is owing to some other cause than the cooling influence of the metal, or that that cooling influence exercises but a partial effect and is not sufficient to account for certain phenomena of flame. In attentively observing the appearances of flame, I have noticed what must have been obvious to any one, that when a wire (the smaller its diameter the better) is inserted into the flame of a candle or gas light, it is surrounded by a dark film of uninflamed gases, or seems to repel the ignited particles of flame in the manner represented in the following figure.



And that this apparent repulsion continues when the wire has become of a white heat similar to that of the flame itself; consequently the dark film cannot be caused by the cooling influence of the wire lowering the temperature of the adjacent gases below ignition. The same appearance is presented when any material, whether a conductor of heat or not, is inserted into or supported over flame; in every case there appears to be an intervening space between the flame and substance employed, and in no instance have I been able to produce apparent contact between such seemingly repulsive substances.

These facts, I imagine, direct to a more probable rationale for the use of wire-gauze; namely, not that the ultimate atoms of flame are larger than the interstices presented to them, but that the particles of flame are repelled by all solid substances, somewhat in the same manner in which heated metal repels the actual contact of water, and when the passage of flame is intercepted by wire-gauze, each wire exerts its repulsive in-

fluence within a certain sphere, and is in such contiguity to the remaining wires that the whole present almost a similar obstacle to the passage of flame as a solid metallic plate, with the advantage of permitting the passage of light and gases for the convenience and security of the miner and philosopher. If this supposition be correct it is a matter of indifference whether the material used in the safety tube of the oxy-hydrogen blow-pipe be a good conductor of heat, and I should be happy to know from some one of your correspondents whether sponge is an effectual security.

I would recommend Mr. Kegg, if he is not supplied with coal gas, to use hydrogen gas alone, as it affords a hot and smokeless flame without burning metallic substances and is sufficiently cheap, as 1lb. old iron with less than 2lbs. sulphuric acid will make 7 cubic feet of gas, and by using a similar gas generator to that of M. Richemonte, lately described in the *Mechanics' Magazine*, a supply of gas would be ready at any time.

Assuring you, Mr. Editor, of the interest I take in your unrivalled periodical, and rejoicing to observe the renewed spirit and interest which a new year seems to have infused into your pages,

I remain, Sir,

Your obedient servant,

V. A.

Sheffield, Feb. 11th, 1841.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—I perceive in your No. 914 a plan for working signals upon railways by Sir George Cayley. In his description Sir George Cayley gives me credit for the suggestion of lines or metallic rods for conveying the signal any given distance from the place at which it is made, but in so doing, he only does me half justice, as by referring to No. 863 of the *Mechanics' Magazine*, Feb. 22, 1840, page 374, Sir George will find that his contrivance has been anticipated in every particular, excepting the mode of compensating for the contraction and expansion of the rods, which I certainly never contemplated by his described method, as I considered it very likely to fail at the time such signals are most wanted—namely, in winter and bad weather.

It gives me much gratification to find a combination of my views in the sound judgment of Sir George Caley; and the public will owe him many thanks if, through the medium of his very sensible paper, this system of signals were to become general. I beg leave, however, to observe, that I have secured patents for this invention for the three kingdoms.

I remain, Sir,

Your obedient servant,

W. J. Curtis.

15, Stamford-street, Blackfriars'-road, February 17, 1841.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—In number 914 of your interesting journal, I see a paper purporting to be a communication from Sir George Cayley, Bart., proposing that to render railway travelling safer than it is at present, that "the engine should be placed 50 yards in advance of the train, so that the engine being stopped by any accident, there would be sufficient space for the train to be stopped by the drags before it came up with the engine." Further, "that the rope from the engine should be so placed in connection with the drags on the train, that as soon as the engine ceased to pull, the drags should instantly work and stop the train."

Although I do not wish to dispute the originality of Sir G. Cayley's invention, I must most certainly claim the *priority*, as it is embodied in a patent obtained by me on the 6th January, 1841; and I consider it the more necessary to make this communication, lest parties unacquainted with the circumstance should unwarily be induced to take steps infringing on the exclusive rights secured to me by my patent.

I feel confident, Mr. Editor, that your usual impartiality will induce you to give an early insertion to these lines; meantime,

I remain

Your most obedient servant,

H. Bessemer.

10, Percival-street, St. John's-street, London, 17th February.

Sir,—In the latter portion of my essay on the means of promoting safety in railway

conveyance, I find that in suggesting the use of a long rope I have, without being aware of it, obtruded upon the patented invention of Mr. H. Bessemer, who has in a polite note informed me of the circumstance, and stated that his patent was taken out in January last, and shown to Mr. Rotch in November. I therefore think it my duty to state this, with your leave, in the *Mechanics' Magazine*, that it may circulate in the same channels, as the essay. I am very glad that the plan of having a considerable distance intervene between the engine and the train is thus corroborated, and that it has been already sufficiently matured to become the subject of a patent.

The other portion of the case, that of a break being applied to the trains the moment the engine ceased to pull, was part of a plan drawn by Mr. Frederick Worsley and myself two years ago, in which the engine was to be attached to the train by means of a lever of a peculiar construction, and so arranged that if the engine were thrown off the rail it became disengaged from the train, which the breaks then immediately stopped.

I am, Sir,

Your obedient servant,

GEORGE CAYLEY.

20, Hertford-street, Feb. 18, 1841.

THE "NEW THEORY OF THE UNIVERSE."

Sir,—I should be extremely sorry to see your useful Magazine converted into an arena for controversy on the mysteries of Divinity. The theme is much too sacred for your pages and for my pen. As for "the hated path of materialism," that is quite a different thing. Because a few vain fools become more vain by looking at a mirror—delighted with their own repetition—shall we break all mirrors, and mar all bright things? It is not the investigation of a subject, but the spirit which is carried to the investigation, which makes it beneficial or dangerous; and, I must add, that an ingenious mechanic is the *last* person to whom I should hesitate to give a clearer insight into the wonders of the material mechanism of the universe, from a fear of its *decreasing* his admiration of the glory of its adapter.

Your correspondent "B. C." having admitted "a firmamental fluid filling up the universe without limit, in a state of positive cold," asks—1st, "Is the power of absorption inherent to the matter, or due to a peculiar disposition of it?" Due to a peculiar disposition of it, with reference to the pressure of the firmamental fluid. 2dly. "Are vitality and vegetation the cause or effect of such a power?" The effect, being a successive event in creation. 3dly. "At all events it must be incessant to produce gravity;" (as incessant as the growth of vegetation and the breath of life,) "and if any contrary motion is the consequence of the reaction of the various fluids constituting the state of positive heat, how could we at once account for so many different movements assumed by the heavenly bodies?" It was the *variety* of the movements of the heavenly bodies which convinced me of the necessity (if we could find it) of a self-adjusting cause. 4thly. "Now I wish to inquire if the electric and magnetic fluids are among the traversing fluids within the atmosphere." All fluids, except the firmamental fluid, are liable to three states—namely, that of traversing or state of continuous emission—that of freedom or separation from a continuous source—that of compulsion or under the influence of other things; consequently the electric and magnetic fluids are occasionally traversing fluids within the atmosphere. 5thly. "And if it is presumable we could render the firmamental fluid actually manifest to our senses in its state of positive cold by some kind of instrument as we do electricity?" I see no method of checking the descent of the firmamental fluid so as to retain it alone; but I am so little accustomed to the inspection of chemical experiments, that I will not say that it cannot be done. I believe most experiments depend on the more or less quantity of its presence. I have said that I am no mathematician, but I dare say I could compare my theory with that generally received on many points, if I might be allowed to ask questions on many which I cannot quite reconcile with my observations of things. I am obliged to "R. O.," and to you Sir.

E. A. M.

February 11, 1841.

ROTARY AND RECIPROCATING ENGINES.

Sir,—In making the following observations, I have not the least wish to

detract from the great merits of the paper "On Rotary and Reciprocating Steam Engines," &c., began at page 114 of the present volume of your Magazine. Nor do I wish by any means to prolong the discussion on the crank, which has, in my opinion, already taken up too much of your valuable space. It is scarcely possible to demonstrate the most simple proposition in any science to a man who is totally ignorant of that science; nor has such a person any right to require you to perform such a task; and any one who understands the simple operation of the resolution of forces, may settle this crank question for himself.

It seems to me not only unnecessary, but improper, to notice the state of the valves, or of the steam, at any particular time (see page 117), because it has nothing whatever to do with the matter in hand. The doubters do not need telling that if no power is expended, none can be lost; but what they want to be convinced of is, that if a certain given power is applied to a crank, it will produce an equivalent effect: and, as I before observed, every one who can resolve one force into two, may convince himself that it will do so.

I am told that the true average pressure of the crank pin in the direction of its motion may be found by the formula for finding the sum of an infinite number of sines given in "Kreil's Sammlung der Mathematischen Formeln," page 119; and that it is 63·66 + per cent.

Tredgold estimated the power of rotary engines too *low* (see page 163, first edition), and not too *high*, as stated at the bottom of page 117 of your Magazine; but this mistake does not in the least affect the very excellent remarks on those engines contained in the same paper.

There are typographic errors in the table at page 117: 195 should be 95, and 190 should be 100.

Yours, &c. &c.

S. Y., AN ENGINEER.

12th February, 1841.

SCREW PROPELLERS.

Sir,—Many readers of your number 913, must have been pleased with the conclusive manner in which the merits of "Submarine Propellers" are spoken of, as given in the extract from the *Bristol Magazine and Western Literary Journal.* Amongst the number I, Sir, am *gratified in a way*, which it is not in my power to express, because it is my *fervent hope and belief* that the merit of the *invention*, as far as the SUCCESS of *submarine propellers* is concerned, is WHOLLY, SOLELY, and INDIVIDUALLY MINE, and that such will incontrovertibly be proved to be the fact, before long.

Mr. Smith has no claim or right to the credit of the successful workings of the *Archimedes*, though he has hitherto had the meed of praise undisputed by me—and why? Because my circumstances hitherto have compelled me to be quiet, and because I was ignorant that my invention had been appropriated by another: Indeed, I should even now have remained ignorant of the fact, but for the accidental discovery of it by a friend.

The "*screw*" patented by Mr. Smith, and placed by him on board the *Archimedes* originally, was no more like the "propeller" to be fitted to the Bristol steam ship than a *half* moon is like a *full* one. His plan, as *he* called it, had been known for years, and tried over and over again with the same result as awaited him—namely, *total unfitness for the purpose to which it was applied.* The inapplicability of the "*entire screw*" to propelling of vessels was well known to every practical engineer of the day, and caused every one of the leading houses in that branch of business (to whom it was offered) to decline all interference with it, when its adoption was first spoken of; and Mr. Smith and his brothers admit that they had great difficulty in inducing the Messrs. Rennie to undertake the task, knowing as *they* did that the *job* had been offered to others previously, and their reasons for declining. These gentlemen are fully acquainted with my claim, and the advantages possessed by *my segments* (described at page 50 of your 31st volume); and, I make bold to assert, would readily assist me in any way in their power as to proving the immense difference of advantage between the *two patents;* I allude to Mr. Smith's and my own.

I have made friends, to whose aid and influence my cause is submitted, and who are disposed to assist me by giving publicity to my claim; and I most earnestly solicit the influence of your powerful and widely circulating publication in support of my cause.

I am, Sir,
Your obedient servant,
JAMES LOWE.

20, New East India Chambers,
Leadenhall-street.

THE EVERLASTING PEN.

Sir,—Your readers may possibly be apprehensive that the Everlasting Pen is going to be an everlasting subject in your valuable pages; I assure them that I should not obtrude it upon their notice, if your correspondents would let me alone, but when they assail me with misrepresentations, under the terrific characters of "Pop" and "Bang," I hope I shall be excused if I stand a little on the defensive and endeavour to give them a "slap" in return, with that most powerful of all weapons—truth.

"Bang" (No. 913,) is in error in stating the present price of my pen at a guinea; since it has been stationary at a pound for four or five years past, but he is correct in saying that I first sold them at 10s. each, and afterwards raised the price. The 10s. was a random guess, after I had made only three or four pens, which had actually cost more than ten pounds a piece, (taking into account the number of fruitless trials before I was able to bring the excessively hard material to a proper figure for writing; the difficulty of formation may be inferred from the fact, that seven years of constant use has not produced sensible wear in any one of my pens; the fair inference, therefore is, that they do not wear at all, and consequently are literally *everlasting*.

After I had made about a dozen pens I found 10s. too little, and advanced the price to 12s. each, in the hope that it might become sufficient after more practice in making them; another dozen or two proved a decided loss, and I advanced to 14s. where I rested for a while without the prospect of immediate remuneration, but was buoyed up by the hope that improved apparatus and quicker methods of working, would ultimately render that price profitable.

My constitutional love of giving a good pennyworth getting the better of my prudence, I persevered at a loss during a year or more, under the delusive impression, too, that the native alloy was to be had in sufficient quantities at a moderate price. But, in 1835, I discovered that of the best alloy in the market, I could scarcely find one particle in a hundred of which a good pen could be made, and consequently I must buy a hundred useless particles for every one I could use.

In order to meet this unforeseen source of expense, the necessity of a large increase of price was thus forced upon me, and I advanced to one pound, at which the price has since continued, with a slow but steadily increasing demand; even this price did not for two or three years yield a living profit.

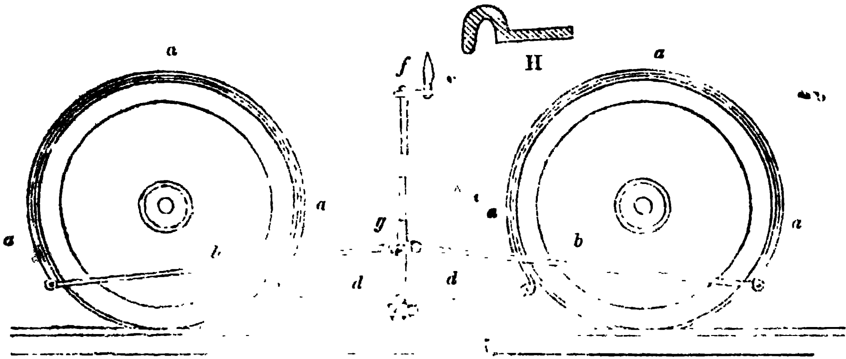
Many purchasers have said, if the pens cost five pounds each they would not be without them, and one professional gentleman has said, if they were raised to ten pounds he must have them; he has already had nearly two dozen for his own use—for his clerks, and for his friends; he employs six for his own writing; three for black ink, and three for red; one broad nib in each colour for rough drafts; one finer for interlineations, and a very fine one for interlineations between the interlineations; he has had some very nearly seven years.

After this candid *exposé* of the facts of the case, I hope your correspondents will no more "Bang" me, nor "Pop" at me, but let me proceed in the "even tenor of my way" to supply the public with a super-excellent article at the lowest remunerative price; for I hold in abhorrence the ultra-selfish principle of buying as cheap and selling as dear as possible. I want only a fair return, and will take no more, as I am too proud to receive any money without endeavouring to give a full equivalent for it. In the case of my pen I consider I give a full equivalent, in a very scarce material, wrought with great difficulty by the most exquisite workmanship, and there is no chance of any reduction of price.

I am, Sir, your obedient servant,
JOHN ISAAC HAWKINS.

Quality Court, Chancery Lane, Feb. 18th, 1841.

IMPROVED BREAK FOR RAILWAY CARRIAGES, ETC.



Sir,—If you consider the above design for a railway break possesses sufficient novelty to entitle it to a place in your valuable Magazine, it is very much at your service.

Description.

a a a, are bands of metal, similar to the friction bands of a crane, placed round the wheels of the carriage.

b b, tension bars connected with the friction bands at one end, and with a traversing screw *c*, at the other, by means of hinge joints.

d d, bars connected like the last with hinge joints, but to the opposite ends of the friction bands, and to another traversing screw *e*.

f, a handle for the conductor to move the screw *g*, which raises the traversing screws, and tightens the band round the peripheries of the wheels to any extent required.

Other modes of working will readily suggest themselves. A very effectual one perhaps, as far at least as the engine is concerned, would be by giving motion to the bars by a cylinder and piston to which the steam might be applied by turning a cock when the break is required in action.

The bands may be applied to all four of the wheels, or only two, as may be preferred. If applied to all, it would form a most powerful machine, embracing, as it does, more than two-thirds the circumference of each wheel.

Should it be objected that the band would be liable to slip off the coned tire, a form similar to H, which shows a transverse section, might be given to it, and would preclude its slipping.

I remain, Sir,

Your obedient servant,

E. M. I.

London, Feb. 8, 1841

ON LIGHTING AND HEATING CONSERVATORIES WITH GAS, WITHOUT THE EMPLOYMENT OF STOVES.

Sir,—During the late frost I have made a few experiments, which appear to me to be likely to prove very beneficial to persons having hot-houses, conservatories, or green-houses, in towns where they have the comfort and convenience of gas lighting. Hearing a lecture at our Mechanics' Institution on Gas, and having seen the various uses to which it was applied in domestic

cookery, a thought struck me that gas might be applied advantageously to hothouses and conservatories, that is, to heat and light them with gas, (without the aid of any other apparatus or material whatever). The frost of last week gave me an opportunity of proving, by various experiments, that two or three common-sized burners, if rightly constructed, will give out heat enough to repel a severe frost. Can any of the readers of your valuable Magazine inform me, if there are any hothouses or conservatories heated by ***gas alone***, and if so, where they might be seen?

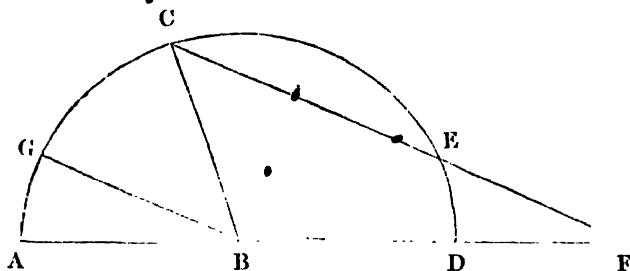
Should you think my humble experiments worthy of notice, I will send you the particulars, and likewise a description of a burner which will supply *Heat, with*, or *without Light*.*

I am, Sir, your obedient servant,

W. P.

Andover, Jan. 12, 1841.

PRACTICAL TRISECTIONS OF PLANE ANGLES. BY DR. PATRICK GILLESPIE.



Sir,—Oblige me by inserting in your valuable publication the following Practical Trisections of any Plane Angle.

Yours respectfully,

PATRICK GILLESPIE.

1841.

Let A B C be any angle less than 135°. From B as a centre, describe a semicircle as A C D; and from C draw C E F meeting the diameter extended at F, so that E F shall be equal to the radius B A or B C; draw B G parallel to F C: the angle A B G is one-third of the angle A B C.

Again.

B

Let A B C be any angle greater than 135.° From B as a centre, describe a semicircle as A C D, and through the point C, draw E C F, touching the circumference at E, and meeting the diameter extended at F, so that E F shall be equal to the radius; through B draw B G parallel to F E: the angle A B G is one-third of the angle A B C.

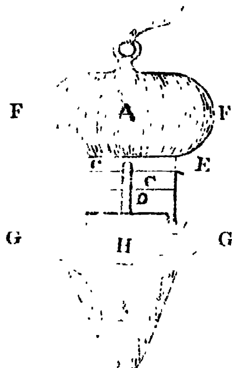
The demonstration of these trisections I leave to your readers. As it might occupy more space than you can spare.

Should the given angle be exactly 135°, the line drawn equal to the radius is a tangent at C, and that drawn parallel to it cuts off an arc of 45°.

* We shall be glad to receive the proffered information. ED. M. M.]

JONES'S SOUNDING LEAD.

Sir,—A description of the following apparatus for sounding may not prove wholly uninteresting to many of your scientific readers. The usual mode hitherto used for the above purpose, is a pear-shaped piece of lead, the bottom of which is covered with tallow, which causes the soil to adhere to it, the chief objection to which is, that if the lead happens to be wet (which is often the case), it must necessarily be dried, and at all times it ought to be made warm to receive the tallow.



The diagram represents a section of my sounding lead. It is made of brass, which is less subject to corrosion than lead. The parts A A are filled with lead; B, a cap or cup, made of thin latin brass for lightness; C C, guides for the upright D, which is to steady the cup. E E, are apertures to allow the water to get at the back of the cup B.

When this apparatus is thrown into the water, its downward pressure causes the cup to rise, when at the bottom, the overhanging part F, throws it on one side, which causes the projecting rim G, to scoop up a portion of the soil, which descends into the hollow H; when raised, the cup B immediately falls and encloses the soil contained in the hollow H in its ascent, the water rushes through the appertures E E, and keeps the cup B in that position.

I am, Sir,

Yours most obediently,

J. Jones, jun.

Hart-street, London.

THE CRANK—LONG AND SHORT CONNECTING RODS.

Sir,—It appears to me as though algebra and geometry were making great mistakes in estimating the loss of power by the crank in your late pages.

In practice, I believe, the crank-pin is always incumbered with the same load in all parts of its revolution, *and is always lifting or pushing this load up an inclined plane*, generating a circle by minute increments, so to speak, by which course, when it (viz. the crank) *perpendicularizes* slowly, the power (say the working steam in the cylinder,) is slowly consumed. Is it correct to talk of loss of power by the *crank*—seeing that for every cylindrical inch of steam consumed, the load rises or progresses an inch perpendicular, supposing the connecting-rod to be of infinite length?

To test this nearly, I constructed a small model, with crank, pulleys, string and weights. On the crank-pin at its lowest point, I hung, say 50 ounces (call it the load), from the same pin I passed a string over two pullies to which I hung also 50 ounces (call it the power), with as much more as would balance the weight of the crank arm and pin—thus placing the two in equilibrio. I then added as much weight to the power end as would overcome the friction, &c., and bring up the crank and its load to the top point, or a semicircle; next I reversed the order of things, placing the power and friction weights on the crank pin, and the load, or 50 ounces on the power end of the string; the result was as before—the crank and its weights descended, and just drew up the load. If there was any difference, it was not sufficient for my model to show.

I am of opinion there is no loss of power by using a crank, but that it is a most beautiful and perfect mode of converting a right-lined motion into a circular one, in the gentlest and smoothest way.

A passing word on long and short connecting-rods. In pursuing the above experiment, first by diagram, I found that in proportion to the shortness of the connecting-rod, the load perpendicularizes faster than the power, during the first half or so of the semicircle upward, and slower during the remainder, consequently, with any connecting-rod, not of infinite length, a greater power than

the load appears to be requisite in the first quadrant, and less in the second.

I remain, Sir,

Your most obedient servant,

J. H. CLIVE.

Bathwick-hill, Bath, Feb. 11, 1841.

TILLEY'S NEW FLOATING FIRE ENGINE.

Sir,—I have just discovered an unfortunate omission at page 168 of your last number, when describing the New Floating Fire Engine.

I should have stated that the Engineer was Mr. W. J. Tilley, of Blackfriars' Road, in justice to whom, I beg the insertion of this in your next number,

And am, Sir, yours respectfully,

WM. BADDELEY.

Feb. 23, 1841.

EXTRAORDINARY EXPERIMENT.

(From the *Times*.)

An experiment was tried on Saturday afternoon, of one of the inventions to which we alluded last autumn, which a friend, on whom we have reliance, had an opportunity of witnessing. The trial took place in the grounds of Mr. Boyd, in the county of Essex, a few miles from town, in the presence of Sir Robert Peel, Sir George Murray, Sir Henry Hardinge, Sir Francis Burdett, Lord Ingestrie, Colonel Gurwood, Captain Britten, Captain Webster, and some other gentlemen, who all appeared very much astonished at what they saw. By the kindness of the inventor our informant occupied a position that enabled him to command a view of all that took place.

A boat, 23 feet long and 7 broad, was placed in a large sheet of water, the boat had been the day before filled in with solid timber, four and a half feet in depth, crossed in every direction, and clamped together with eight-inch spike nails. This filling in was made under the inspection of Captain Britten, who stated the fact to the distinguished gentlemen we have mentioned, and also that the inventor never went near the workmen employed, that no suspicion might be entertained of any combustible materials being lodged in the hold of the vessel. Several of the gentlemen were on Saturday rowed in a punt to the vessel, and examined for themselves, so that every doubt might be removed as to the cause of destruction being external, and not from the springing of any mine. When the different parties had taken up their positions, on a signal from the inventor, the boat was set in motion, and struck just abaft her starboard bow, and instantaneously scatted into a thousand fragments. At the moment of collision the water parted, and presented to the eye of our informant the appearance of a huge bowl, while upon its troubled surface he noticed a coruscation precisely resembling forked lightning. A column of water was lifted up in the air like a huge fountain, from which were projected upwards for many hundred feet the shattered fragments of the vessel, which fell many of them several hundred yards' distance in the adjacent fields. Our informant examined many pieces, and found the huge nails snapped like carrots; the mast looked like a tree riven by lightning, and never before, as he assures us, has he witnessed so sudden and complete a destruction, though he has seen shell and rocket practice on the largest scale. Such seemed to be the unanimous opinion of all present. How this mighty effect was produced was of course not disclosed to so numerous a party, but two naval officers present were perfectly aware of the mode of operation, and the inventor offered to go into details confidentially with one or two of the distinguished officers present. In answer to a question from Sir Henry Hardinge, the inventor stated that without a battering train he could transport on a mule's back the means of destroying the strongest fortress in Europe. No doubt this is very startling, but, hearing what we have, we cannot pronounce it impossible; and as in every particular the inventor has done what he has undertaken to accomplish, it is only fair to give him credit for the performance of more than has yet been disclosed. The existence of these tremendous powers is placed beyond all doubt, and the inventor asserts them to be completely under his control, which from what our informant has had an opportunity of observing, he believes to be really the case. The instrument that wrought so terrible an effect on Saturday, lifting into the air a boat weighing two and a half tons, and filled in with five and a half tons of solid timber, and displacing at least fourteen or fifteen tons of water, was only 18lb. weight. Our informant has handled it and kicked it round a room when charged with its deadly contents, so portable and at the same time so safe is it—a point of vast importance, when we remember the daily accidents that are occurring from the detonating shells now used in our service. At Acre most of those employed burst before they reached their object, and they are liable to explode when rolling about a ship's deck, as was proved by the fatal accidents on board Her Majesty's ship *Medea*, off Alexandria, and the *Excellent*, at Portsmouth, and are dangerous to carry in a common ammunition cart on a rough road.

CONDENSATION.—PARTING NOTICE FROM MR. HOWARD TO MR. SYMINGTON.

Sir,—Mr. Symington's last communication demands a parting notice from me. I regret very much that he should have attempted to convert the controversy on the points at issue into a petty or personal matter of dispute, and in which I have not in any instance, that I am aware of, followed his example. But I must now beg to remind him that this is not the proper method of treating a scientific question, much less of defending himself from the incorrect statements (so shown or attempted to be shown) he has indulged in; and which no consideration shall induce me on any future occasion, should such arise, to refrain from animadverting upon. The attainment of the truth is at all times worth a personal scratch or two. The fruit is not the less sweet on that account.

I should not be justified in drawing from his privacy the director of the Peninsular Company, who gave me the information (why called extraordinary?) on the City of Londonderry affair. But has Mr. Symington made even an attempt to impugn the *facts* set forth? Let him gainsay them if he can. They are much more worthy of his attention than the name of an individual, as are also certain other facts, relating to the invention and practice of the method of condensation, alluded to in my correspondence, but which he has not thought proper to notice, and on which I therefore may presume judgment must go by default.

And here, Mr. Editor, will you allow me to turn to another and more refreshing subject by congratulating you and your subscribers upon your selection of the *admirable* treatise (in Nos. 913 and 915) on the crank, from the new edition of the Encyclopedia Britannica. The additional publicity which your journal will give to this able exposure of a very generally rooted error, daily misleading hundreds of inventors and beginners in practical mechanics (let them study it thoroughly) will do infinite service. And not only so, but such articles tend to elevate the character and still further promote the usefulness of your periodical.

I am, Sir, your most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe, 23rd Feb. 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

FELIX TROUBAT, OF MARK-LANE, MERCHANT, *for improvements in the manufacture of vinegar.*—Enrolment Office, February 1, 1841.

To 350lbs. of raw potatoes, well rasped are added from 20 to 25 gallons of water and 2 lbs. of sulphuric acid; this mixture is to be boiled for six hours, and then run off into a cooler, through a perforated plate or strainer, to free the liquor from sediment, and afterwards transferred to another vessel placed in a chamber of a temperature of 80° of Fahrenheit. One ounce of potash dissolved in water, and half a bushel of yeast are added to the liquor; at the expiration of three days a further quantity of yeast is added to increase the fermentation. A vessel is loosely filled with shavings of beech, or the skins of pressed grapes saturated with strong vinegar. Three gallons of the fermented liquor are poured in mornings and evenings till the vessel is filled. It is then drawn off, three gallons at a time, from the bottom of the vessel, and poured into another vessel half filled with perfect vinegar, from which it is removed into another loosely filled with beech shavings to cool and clear it, which renders it fit for use. Another process consists in pouring 50 gallons of boiling water upon 350 lbs. of potatoes that have been well crushed and washed, and allowing it to stand until it assumes the consistence of a thick paste, when half a bushel of meal of malt is added to bring it into a saccharine state; it is then submitted to the process of fermentation, &c., as before described.

In another process, 50 or 60 lbs. of ground rice is used in lieu of the potatoes, and treated according to the directions first given. The patentee does not confine himself to any of these precise proportions but claims, 1, The mode of making vinegar by the application of potatoes. 2, The mode of making vinegar by the application of rice as described.

JOHN SANDERS AND WILLIAM WILLIAMS, OF BEDFORD, IRON FOUNDERS, AND SAMUEL LAWRENCE TAYLOR, OF OLD WARDEN, BEDFORDSHIRE, MACHINE MAKER, *for improvements in ploughs.*—Enrolment Office, February 3, 1841.

These improvements consist in the first place of a method of affixing the coulter to the beam of ploughs, by a frame moving on a bolt or axis which passes through the beam. The coulter is capable of being adjusted to any desired angle, by means of a set screw passing through a fixed nut on the beam of the plough. Or the coulter may be attached to the plough-beam, by a sliding socket furnished with a set screw by which it can be made fast at any desired part of the plough-beam; the coulter is affixed to a projecting angular faced plate by a clamp, formed of a plate bent at right angles at top and bottom, and having two recesses formed in it. It has also two set screws each having an eye to receive the stem of the coulter.

The stem of the coulter is drawn against the angular face of the plate, by the two set screws, and according as the upper or lower nuts are tightened the angular position of the coulter is regulated, approaching more or less to the vertical position. In another arrangement the coulter is fastened to the beam of the plough in any required position, by a clamp and set screw, and can be made to stand off at any angle from the beam, by a sliding plate and set screws.

The claim is to,—1, The mode of applying coulters to ploughs, so that by means of clamps and screws, the distance of the coulter from the beam, and also the angular position of the coulter, can be regulated.

2. The mode of applying a coulter, whereby the coulter is caused to stand off at any angle from the plough-beam by means of set screws and a sliding plate.

HENRY TREWHITT, OF NEWCASTLE-UPON-TYNE, ESQ., *for improvements in applying the power of steam-engines to paddle-shafts used in propelling vessels.*—Enrolment Office, February 7, 1841.

These improvements consist in a new method of applying the crank-pin of paddle-shafts, so that one or both of the paddles may be disconnected or connected with the engine with great facility. For this purpose there is on each of the paddle-shafts a narrow cylinder, with a groove on its periphery, to receive a strap which is attached to the crank-pin that drives the paddle-shaft. The other end of the crank-pin is keyed into the crank of the middle shaft. In order to connect the paddle-wheel with the engine, the strap is made to bind tightly upon the narrow cylinder, and is disconnected by being loosened, in the following manner. A cross-head passes through slits in the end of the strap, and is fastened to a cushion resting on the narrow cylinder, and curved on its under surface so as exactly to fit. When the paddle-shaft is to be connected to the engine, the cushion is made to press upon the narrow cylinder by a wedge-shaped bar, which enters between the back of the cushion and the cross-head; this causes the strap to bind tightly upon the cylinder and forms the connection required. On withdrawing the wedge-shaped bar, the strap becomes loosened and the paddle-shaft is disconnected from the engine.

The claim is to the mode described of applying the crank-pins to paddle-shafts.

WILLIAM BEETSON, OF BRICK-LANE, OLD-STREET, SAINT LUKE'S, BRASSFOUNDER, *for improvements in water-closets and stuffing-boxes, applicable to pumps and cocks.* Enrolment Office, February 5, 1841.

The first of these improvements relates to water-closet valves, which are made of the usual form, but instead of closing upon a horizontal seating they rest in an angular position. On raising the handle the valve is brought up past the vertical position towards the back of the water-closet, so as to be out of the way of soil, paper, &c., which might otherwise adhere to it. The patentee applies a valve to the bottom of the overflow pipe always having a tendency to keep closed, and only opened by the pressure of the overflow of water. By these means all kinds of effluvia are prevented from passing from below up into the basin.

The second improvement consists in the application of flexible cups to close the openings through which the handles of pumps and cocks pass. A cup of some flexible material (leather being preferred) is screwed around the opening through which the handle works, while the centre of the cup is screwed to the handle which passes through it, thereby forming a fluid-tight stuffing-box, applicable to pumps, and all cocks having slide-valves.

The claim is to, 1. The mode of applying valve-seats and valves to water-closets, whereby the valves are in an inclined position when closed.

2. The mode of applying flexible cups to close the openings through which the lower handles of pumps and cocks pass, in order to form stuffing-boxes thereto, as above described.

ANDREW SMITH, OF PRINCES-STREET, LEICESTER-SQUARE, AND OF MILL-WALL, POPLAR, ENGINEER, *for certain improvements in carriage wheels, rails, and chairs, for railways* Enrolment Office, February 7, 1841.

The improvement in wheels consists in the application of a wrought iron tire, having a right-angled groove turned out in the middle, corresponding to the rail which constitutes the second part of these improvements. The depth of this groove is to be proportionate to the size of the rail, and forms a flange within the surface of the tire, tending to keep the wheel in its place upon the rail.

The rails are square bars of iron, the sides of the squares being about one-third wider than the depth of the sides of the groove in the tire of the wheels, for the purpose of preventing the wheels from coming in contact with the chairs and sleepers. These rails are laid in grooves cut in wooden sleepers, and present one of the angles of the square upwards, corresponding with the angular groove in the tire of the wheel.

The chairs are made of wrought or cast iron; they clip the sides of the rails in a dove-tail form; and are let into, and bolted down to the wooden sleepers.

The rails are each 12 feet long, by 2¼ inches square, and the chairs are placed in the middle and at the junctions of each rail.

The claim is to, 1. The right-angled grooves

in the tires of the wheels of railway carriages, instead of an external flange.

2. The adaptation of common square bar iron, or of iron made in a square form, let into a wooden sleeper.

3. The chair, for connecting, and fixing, and fastening the rails.

DOWNES EDWARDS, OF SURBITON-HILL, KINGSTON, SURREY, FARMER, *for improvements in preserving potatoes and other vegetable substances.* Enrolment Office, February 8, 1841.

The preservative process, as applied to potatoes, is as follows:—The potatoes being well washed and cleansed are boiled or steamed till the skins begin to crack; they are then peeled, and any eyes or specks carefully removed; they are next put into a cylinder of plate iron tinned on the inside, and pierced all over with small holes (about one-eighth of an inch in diameter); a piston is forced down into the cylinder by means of a screw, which drives the potatoes out through the small holes in a finely divided state; the substance thus obtained is spread thinly and evenly upon hollow tinned iron tables heated by steam. The heat is at first equal to about 160°, but as the potatoe approaches dryness, it is diminished to 100°, by regulating the cocks which supply the steam from the boiler, where a constant pressure of 10 lbs. on the inch is maintained. While they are upon the hollow tables, the potatoes are constantly stirred about, and when thoroughly dried, are to be packed in casks or other suitable vessels for keeping.

The claim is, for the mode of preserving potatoes in a cooked or partially cooked state, by means of obtaining the substance of potatoes in a separated, or finely divided, and dried state.

BARON CHARLES WETTERSTEDT, OF LIMEHOUSE, *for improvements in preserving vegetable, animal, and other substances from ignition and decay.* Enrolment Office, Feb. 11, 1841.

In the first place, in order to prevent ignition, the patentee uses the following composition:—A saturated solution of common soda is slowly evaporated in a close shallow vessel until highly concentrated; it is then allowed to cool and crystallize. These crystals are dried on canvas stretched on frames, and to five or six parts by weight is added one part of gum or gelatine, and they are pounded together in a mortar. This composition is exposed to the action of carbonic acid gas for twelve hours, on canvass stretched on frames in a close room. The composition is then removed, well stirred, and again submitted to the action of the gas for twelve hours more. In using this composition, for rendering muslin, calico, &c., fire proof, one pound of it is to be dissolved in a quart of warm water, and used in the same way as starch. The articles may afterwards be ironed or mangled, but if ironed, the irons must not be so hot as usual.

The mother water of the first crystals are evaporated and crystallized, and used for commoner purposes. A coarser kind of composition, for rendering wood fire proof, may be made of these crystals and ground glue.

Secondly, in order to prevent the ignition of buildings, the walls and ceilings of the rooms, as well as the roofs of buildings, are to be covered with metal plates, a space being left to be filled up with some non-conducting substance. Along the ridge of the roof there is a large pipe with smaller pipes branching off in various directions, so that in case of fire, water being thrown up into these pipes, the roof can be deluged with water. Pipes perforated full of small holes are to be carried round the upper part of rooms, and to communicate with an elevated cistern of water, or a force pump, by which means a shower of water can be thrown into the room in case of fire. Another mode of effecting a similar object, is by suspending a pipe, open at both ends, from its centre by a hollow axis, close to the ceiling of the room, exactly like the revolving arms of a Barker's mill. Water from an elevated reservoir or force-pump being introduced, the arms spin round and scatter the water all over the rooms.

Thirdly, a peculiarly shaped vessel filled with water is to be kept suspended near to fire-places, so that in the event of a person's clothes igniting, the water may be thrown over them.

The first part of this patent has some slight claim to novelty and usefulness—the second part contains nothing new – the third part is extremely ridiculous.

JOHN PETER ISAIE PONCY, OF WELL-STREET, OXFORD-STREET, WATCHMAKER, *for improvements in clocks and chronometers,* Enrolment Office, February 13, 1841.

These improvements relate to the construction of clocks and chronometers with two main-springs, in conjunction with a constant power or regulator, so that they will go for a longer period than usual without winding-up. The constant power or regulator is a wheel of 80 teeth, inside of which there is a barrel with serrated edges having a spring and catch, and kept by two holding pieces. When this "constant power" is applied to a clock, the wheel works into the pinion of the escapement. By varing the size of the wheel, the length of time that the clock will go, will also be varied.

Among other advantages claimed for this mode of construction is this, that should either of the main-springs break, the other will be sufficient to keep the chronometer, &c.,

going, but, as only one half of the power would be exerted, it would be necessary to wind it up twice, in the time it would have gone had both barrels continued in action. Another advantage is, that the spring not being connected directly with the escapement, a common spring may be employed for the purpose.

LIST OF DESIGNS REGISTERED BETWEEN JANUARY 26TH AND FEBRUARY 24TH.

Date of Registration, 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Jan. 26	554,8	J. Boswell	Stained paper	1 years.
"	559	J. Shillito	Ribbon	1
27	560,1	G. Clarke and Co.	Cantoon	1
"	562,3	Barber and Cole	Carpet	1
29	564	T. R. Mellish	Postage damper	3
"	565,6	J. Gough and Sons	Carpet	1
Feb. 1	567	R. Rettie	Anti-drabble	3
"	568	E. B. Taylor	Envelope	1
"	569	W. Ellis	Enema	1
2	570,1	H. I. and J. Dixon	Carpet	1
"	572,5	Buckley brothers	Cantoon	1
3	576	J. Chatwin	Button	3
"	577	B. Cribb	Label	1
"	578	G. Harris and J. D. Cumming	Carpet	1
5	579	R. S. Stenton	Knife	3
"	580	Wright and Crump	Carpet	1
8	581,2	J. Gough and Sons	Ditto	1
"	583	T. Johnson	Eye (for books)	3
9	584	J. Warden, jun.	Linch pin	3
10	585	H. I. and J. Dixon	Carpet	1
11	586	S. Coote	Oven	3
"	587	W. and H. Hutchinson	Knife	3
"	588	J. Newcomb and Son	Carpet	1
12	589	Broadhead and Atkin	Ornament	3
15	590	Lea and Co.	Carpet	1
"	591	J. Jones	Stove grate	3
"	592	W. Arrowsmith	Brace fastener	3
16	593,604	H. N. Turner and Co.	Stained paper	1
17	605,6	G. Clarke and Co.	Cantoon	1
"	607	J. E. Kingdon	Horticultural label	3
19	608	S. Ackroyd	Stove	3
"	609	S. Mordan and Co.	Postage damper	3
"	610	W. Ball and J. Walker	Pen	3
22	611,612	G. Clarke and Co.	Drill	1
"	613,14	Ditto	Cantoon	1
"	615	T. Hopkins	Carpet	1
"	616,17	Lea and Co.	Ditto	1
23	618	J. Scholl	Garden engine	3
"	619	J. W. Edginton	Cock	3
24	620	Alexander Milner	Hearth plate	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 30TH JANUARY, AND THE 23RD FEBRUARY, 1841.

Charles Schafhaeutl, of Swansea, Doctor of Medicine, Edward Oliver Manby, of Parliament-street, civil engineer, and John Manby of the same place, civil engineer, for improvements in the construction of puddling, balling, and other sorts of reverberatory furnaces for, the purpose of enabling anthracite stone coal or culm to be used therein as fuel. January 30; six months

James Mac Lellan, of the city of Glasgow, manufacturer, for an improved combination of materials for umbrella and parasol cloth. January 30; six months.

Ezra Jenks Coates, of Broad-street, Cheapside, merchant, for improvements in the forging of bolts, spikes, and nails. (A communication.) Jan. 30; six months.

Henry Passe, of Great Portland-street, pianoforte manufacturer, for improvements in castors. February 1; six months.

Charles Hood, of Earl-street, Blackfriars, iron merchant, for improvements in giving signals. February 1; six months.

William Wilkinson Taylor, of Barrowfield-house, Westham, Essex, gentleman, for improvements in buffing apparatus for railway purposes. Feb. 1; six months.

Dominic Frick Albert, of Cadishead, Manchester, L.L.D., for an improved or new combination of materials and processes in the manufacture of fuel. February 1; six months.

Francis Sleddow, jun., of Preston, machine-maker, for certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances. February 2; six months.

William Ward Andrews, of Wolverhampton, ironmonger, for certain improved methods of raising and lowering windows and window blinds, and opening and shutting doors, which are also applicable to the raising and lowering of maps, curtains, and other articles. Feb. 2; six months.

Thomas Young, of Queen-street, London, merchant, for improvements in furnaces or fire-places for the better consuming of fuel. Feb. 3; six months.

William Hancock, jun., of King-square, Middlesex, accountant, for an improved description of fabric suitable for making friction gloves, horse

Brushes, and other articles [illegible]quiring rough surfaces. Feb. 3; six months

Joseph Bunnett, of Deptford, engineer, for certain improvements in locomotive engines and carriages Feb. 3, six months.

John Cartwright, of Loughborough, manufacturer, Henry Warner, of the same place, manufacturer, and Joseph Haywood, of the same place, frame smith, for improvements upon machinery [illegible]monly called stocking frames or frame work kn[illegible] machinery. Feb 4; six months

Thomas Griffiths, of Birmingham, tin pl[illegible]ker, for certain improvements in such dish cove[illegible]s are made with iron covered with tin Feb[illegible] six months.

James Thorburn, of Manchester, mecha[illegible], for certain improvements in machinery for producing knitted fabrics. Feb. 8, six months

William Ryder, of Bolton, roller and spindle maker, for certain improved apparatus for forging, drawing, moulding, or forming spindle rollers bolts, and various other like articles in metal Feb[illegible], six months

Thomas Fuller, of Salford, machine maker, for certain improvements in machinery or apparatus for combing or preparing wool or other fibrous substances (Partly a communication) Feb 8, six months

Elisha Oldham, of Cricklade, Wilts, railroad contractor, for certain improvements in the construction of turning tables to be used on railways Feb 8, six months.

Charles Green, of Birmingham gold plater, for improvements in the manufacture of brass and copper tubes Feb 8, six months

William Wigston of Salford, engineer, for a new apparatus for the purpose of conveying signals or telegraphic communications Feb 8, six months

John Scott, of Great Bowden, Market Harboro, timber merchant, for improvements in constructing railways, and in propelling carriages thereon, which improvements are applicable to raising and lowering weights Feb 8, six months

James Johnston, of Willow Park, Greenock, esq, for improvements in obtaining motive power Feb 8, six months

William Henry Fox Talbot, of Lacock Abbey, Wilts, esq, for improvements in obtaining pictures or representations of objects. Feb. 8 six months

William Edward Newton, of Chancery-lane, Middlesex, mechanical draftsman, for improvements in obtaining a concentrated extract [illegible]op, which the inventor denominates "Humuline." (A communication) Feb 15, six months

Theophilus Smith, of Attleborough, Norfolk, farmer, for certain improvements in ploughs Feb 15, six months

James Whitelaw and George Whitelaw, engineers of Glasgow, for a new mode of propelling vessels through the water, with certain improvements in the steam engine when used in connection therewith, part of which improvements are applicable to other purposes. Feb 15 six months

Philip William Phillips of Clarence-place, Bristol, gent, and William Bishop Peck, of Broad-street, Bristol, wine merchant, for improvements in four-wheeled carriages, Feb 15 six months

James Ransome and Charles May, of Ipswich, machine makers, for improvements in the manufacture of railway chairs, railway and other pins and bolts, and in wood fastenings and treenails Feb. 15, six months.

William Scamp, of Charlton Terrace, Woolwich, surveyor, for an application of machinery to steam vessels for the removal of sand, mud, soil, and other matters from the sea, rivers, docks, harbours, and other bodies of water Feb 16, six months

William Samuel Henson, of Allen-street, Lambeth, engineer, for certain improvements in steam engines. Feb 16; six months.

George Edward Noone, of Hampstead, engineer, for improvements in dry gas meters. Feb. 18, six months

William Orme, of Stourbridge, iron master, for improvements in the manufacture of cokered spades and other cokered tools. Feb. 18; six months.

John Collard Drake, of Elm-tree-road, St. John's Wood, land surveyor, for improvements in scales used in drawing and laying down plans. Feb[illegible] six months

Anthony Bernhard von Ra[illegible] upon-Hull, engineer for certai[illegible] fire grates and in parts co[illegible]ith for furnaces for heating fluids Feb[illegible] six months.

William Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in the process of and apparatus for purifying and disinfecting greasy and oily substances or matters both animal and vegetable (A communication Feb 22 six months.

Thomas William Booker of Melin Griffiths Works, near Cardiff, ironmaster, for improvements in the manufacture of iron Feb 22 six months

Jonathan Guy Dashwood, of Ryde, Isle of Wight, plumber, for improvements in pumps Feb 22, six months

Moses Poole, of Lincoln's Inn, Middlesex gent, for improvements in tanning and dressing or currying skins (A communication Feb 22, six months

John Dean of Dover, chemist for improvements in preparing skins and other animal substances for obtaining gelatine and glue, and in preparing skins for tanning, Feb 23 six months

Charles Smith of Nottingham, lace manufacturer, for certain improvements in machinery for the making or manufacturing of stockings or other kinds of loop-work Feb 23 six months.

NOTES AND NOTICES

City Fire Escapes—On Wednesday the Police Committee met at Guildhall to receive the fire-escapes which had been prepared by their orders The portable fire-escape ladders of Mr Merryweather described at page 166 of our last number attracted considerable attention, and were much admired for their completeness, and facility of application A set of brigade fire-ladders on a somewhat similar carriage but having all the appendages detached were produced by Mr Tilley Cressey's sliding-ladders on Wivell's carriage made by Mr Tilley, were also highly approved, these ladders are capable of being extended to seventy or eighty feet, and are calculated to render assistance at heights to which the others could not possibly be applicable Eight months have elapsed since this subject was taken in hand by the city authorities, and perfect machines of the two most approved kinds of fire-escapes being completed, it is to be hoped no farther delay will arise in providing the police with such a number as will prevent a recurrence of fatal fires within the city boundaries

Science in Calcutta—It having come to the knowledge of some of the friends of Professor W B. O'Shaughnessy, M.D at Calcutta that the splendid gold galvanic battery, which he lately constructed by order of the Earl of Auckland, and for which government kindly gave the loan of the metal, was about to be melted up, it has been proposed to raise the sum of about six thousand rupees by subscription, necessary to purchase the instrument, and to solicit the Governor General's permission to do so, and present it to the Doctor in token of their gratitude for the instruction and amusement he has already afforded the society of Calcutta through it, and in admiration of that gentleman's almost unrivalled talents —*Calcutta Gazette.*

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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ARTHUR AND EDDY'S APPARATUS FOR RAISING MINE PUMPS.

Fig. 1.

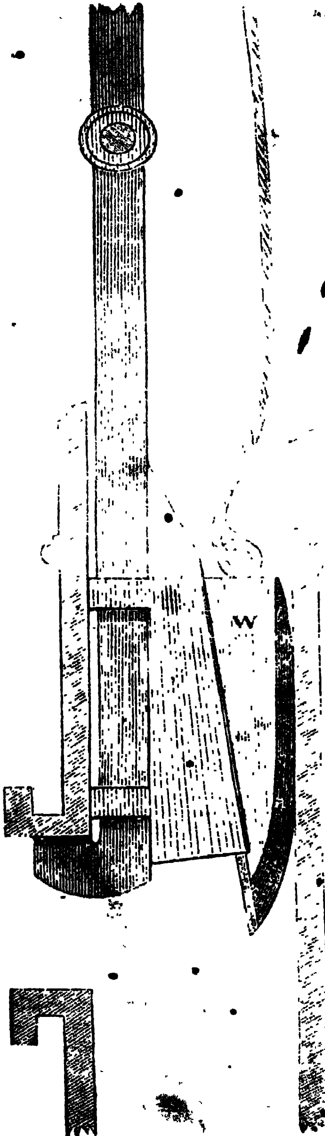
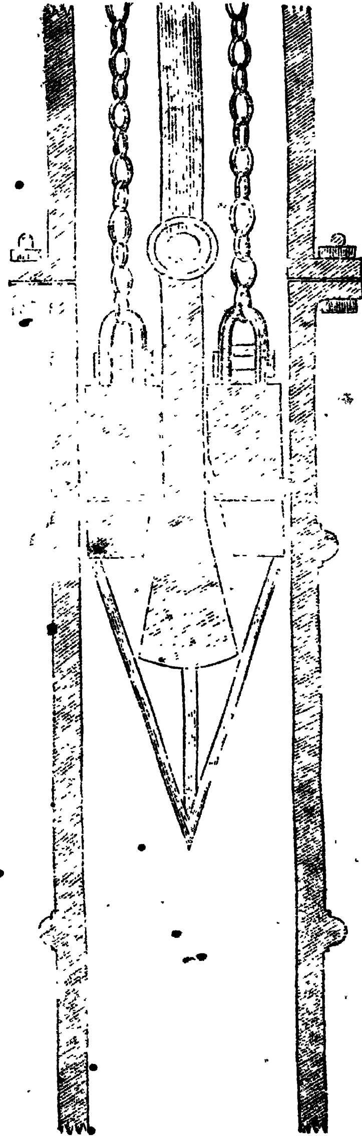


Fig. 2.



ARTHUR AND EDDY'S APPARATUS FOR RAISING MINE PUMPS.

In our volume xxxii, page 113, we published an account of the Seventh Annual Meeting of the Royal Cornwall Polytechnic Society, with a few brief notices of some of the inventions then brought forward.

We have just been favoured with a copy of the Seventh Annual Report, of this highly useful and prosperous society, from which we have extracted the following paper, which will, doubtless, be read with considerable interest, containing, as it does, a practical description of a successful method of performing a work of no ordinary difficulty. As opportunity serves, we shall again recur to the pages of this instructive report.

Statement of the means employed in taking up heavy lifts of pumps from under water in Penyfron Shaft Mold Mines, Flintshire.

Penyfron Shaft is 40 fathoms deep under the adit, in which were three lifts of 22 inch pumps, the top lift being a plunger, and the two others drawing lifts. The mine had been stopped for some years, and it was now desired to take up all the pumps. The water stood about 6 fathoms under the adit, and 6 fathoms of the top lift were therefore taken up without difficulty.

The remainder of this lift was drawn by a crook which laid hold of the throatway of the H piece, and was kept in its place by a wedge dropped behind it by a rope.

For the rose lift, the apparatus represented by fig. 1 (on our front page) was contrived by Captain John Eddy of the Mold Mines. This was attached to about 26 fathoms of very strong iron rods, the upper part of which were secured to the capstan rope, the capstan being assisted by winches and blocks, the wedge *w*, was elevated so as to pass easily into the pumps, and made fast in that position, the whole was dropped to the clack door of the lift, and turned round until the hook had entered the opening, when the rope which held up the wedge being let go, the hook was safely held in the throat of the door way, and the whole was drawn to the level of the water, and the pumps taken off one at a time. This lift of pumps was 12 fathoms long, and weighed about 14 tons, but the force exerted was much greater than required to weigh this, as the stays had to be broken, some pieces of which were oak, one foot square, and about 6 feet long, these were parted in two, and came up adhering to the pumps.

The crown, or bottom lift, was about 12 fathoms long, and with a sliding windbore, and some other things attached weighed nearly 20 tons.

The top of this lift was about 25 fathoms under water, and there was no door way above the box which remained in the working barrel, owing to the bucket sword having been broken in trying to draw it, and there being a quantity of stuff in the pumps above the box; there was no place to catch by a hook, and nothing to lay hold of but the smooth interior of the pumps, and thus considerable difficulty presented itself to taking hold of it in a secure manner.

To endeavour to raise this lift, the apparatus shown at fig. 2 (see our front page), was constructed by Mr. John Arthur, of the Mold Mines Foundry.

Being dropped through the water into the column, it was lowered to the second pump from the top. This was done by attaching the inverted cone to the iron rods, the cast iron block containing the cutters or tongues being kept up to such a height by two chains carried up by the side of the rods above water, that the steel points of the cutters did not project beyond the circumference of the iron block. When it was ascertained that the apparatus was fairly in the column, the chains were eased so as to suffer the iron block to descend on the inverted cone, which forced out the tongues, so as to press against the inside of the pump, and the iron rods being attached to the capstan rope, assisted by three powerful winches working three pair of blocks reefed with new whim ropes; the whole was weighed, safely brought to the surface of the water, and taken up—the bearers and stays being broke as before.

The ends of the tongues were well steeled, and the impressions made in the inside of the pumps were not more than ¼ inch deep.

ON WORKING LOCOMOTIVES WITH TWO FIXED ECCENTRICS.

Sir,—Your correspondent J. C. Pearce has, in No. 906 of your valuable journal, furnished us with a mode of working and reversing the action of locomotive engine valves with two fixed eccentrics, which was, in No. 910, commented upon by "P. O. P." where he says that if he (Mr. Pearce) "will reconsider his plan, and reverse the position of his piston in the diagram, fig. 2, page 575, it will not be difficult for him to see the futility of it—in fact, whatever might be the amount of lead or advance which the slide would have in the position there shown, it would be just as much in arrear at the opposite end of the stroke, and consequently worse than if it were placed at half stroke, with the crank on the centre." Now, Sir, it appears to me, that "P. O. P." has jumped to his conclusion rather too hastily, for he seems to have altogether forgotten that in order to reverse the position of his piston he must alter the position of the eccentric rods, in which case, if "P. O. P." "will reconsider" Mr. Pearce's plan, he will find that the valve will have the lead both ways.

Let us suppose the crank to be at C, in the diagram fig. 2, and it were required to move towards B, the eccentric is fixed at right angles to the crank, as at *e*, the eccentric rod is attached to the end of the lever at S; then it is evident that the direction of the eccentric rod would be from K to J, and the extremities of the throw would be where the line J K intersects the circumference of the circle described by the eccentric in its revolution, and (if we suppose the eccentric rod to move parallel to itself, as it does nearly so) when the eccentric reaches the line H I, in the direction of L, H I being at right angles to J K, and both passing through the centre of the axle, the eccentric must have made half its stroke, consequently the distance from the point of intersection of H I to C must be the quantity of lead: for, as was before stated, the eccentric is at right angles to the crank, therefore the crank must then be at K, which is short of its centre C. By proper attention to the diagram it will be seen that by attaching the rod to the other lever at V, and taking the lines N O and F G, instead of J K and H I respectively, and the arrow P, that you will get the same quantity of lead as before.

As regards the originality of working locomotives with two fixed eccentrics I know nothing. As "Nauticus," in No. 913, thinks it was with Mr. Pearce, it is probable that the plan may be original to him, but there were several engines made on that principle for the Grand Junction Railway, by Messrs. Sharp, Roberts, and Co., of Manchester, soon after that line was opened, but the principle does not appear to have been understood, for I remember that when they were in the forward gear they were fixed on the lower pin of the weigh-bar lever, and the eccentrics being set to suit that motion, they would not go so well backward. There were also some made by Messrs. Rennie, of London, for the London and Southampton Railway (now London and South Western,) which were attended with the same fault. I think the plan may do very well for a marine engine, but for a locomotive I think that owing to the eccentric rod being altered in its direction it would partake of the vibration of the axle so much that it would make the motion of the valve very irregular.

I am, Sir,

Yours, respectfully,

J. LOVATT.

5, Bond-street, Vauxhall, Feb. 15 1841

PEARCE'S METHOD OF WORKING THE SLIDE VALVE OF LOCOMOTIVE ENGINES WITH TWO FIXED ECCENTRICS.

Sir,—I have just had the pleasure of perusing the last monthly part of your highly interesting journal; in which, at page 36, I find a communication from your correspondent "P. O. P.," who, I am inclined to think, either does not, or will not, understand what he has been writing about, for it is quite evident he has condemned what he never tried. He states that if I reverse the position of the piston, I shall have the lead given the wrong way. I perfectly understand what he means, but beg to state this is not the case in *my plan*, although it is in this point, that most of the other plans I have seen or heard of, have failed.

I have supposed the position of the piston to be reversed, and have shown what alteration is required and produced

in the position of the valve; and I therefore recommend your correspondent "P. O. P." to examine very minutely this part of the subject, as I think he will then be convinced of the very great mistake he is now labouring under—seeing that the valve will have the *proper lead*, and in every other respect be as I have stated. I forbear to extend my remarks, because I have every reason to believe that Mr. "P. O. P." has not given the subject proper consideration.

"P. O. P.," "*laying aside the principle of expansion*," questions the utility of the *lead*. Why should he lay aside the principle of expansion? What connection is there between the lead and expansion, or what has expansion to do with the lead?

I remain, Sir,
Yours very respectfully,
J. C. PEARCE.

February 4th, 1841.

ON THE SUPPLY OF WATER AT FIRES.

Sir,—As experience proves that serious deficiencies of water will continually arise when conflagrations render the presence of that element most indispensable, it is well worth while to consider whether any and what sources might be made available, in aid of these deficiencies.

There are several parts of the metropolis where no water pipes are laid down, and many other places although provided with pipes, are so far distant from the source of supply, as almost to preclude the possibility of a timely arrival, so as to "nip i' the bud" incipient conflagrations.

Within the last fortnight two distinct fires occurred in Bermondsey in one day, in both of which the buildings, with their contents, were entirely consumed before a drop of water could be obtained.

I have on many occasions observed, with much regret, a most extraordinary and unaccountable unwillingness on the part of housekeepers in the immediate vicinity of a fire, to contribute their small stock of water towards the suppression of that, which unopposed, must inevitably be a common danger. At a fire in Walworth, some time since, I applied to the owner of some premises closely adjacent to those on fire, for access to a supply of water which he was said to possess, in order to save the surrounding buildings which were at the time in the most imminent danger; he denied having any water, but happening to enter his premises at a later period of the fire, I found the information first given me was correct, *five or six butts full of water being on the premises!*

In country places, it is the universal practice to collect all the water from every available source, pumps, ponds, wells, cisterns, butts, &c., being speedily laid under contribution, to afford the firemen materials wherewith to oppose the onward progress of their ruthless foe. But in London, it is such a regular matter of course to look to the *plugs* as the legitimate source for obtaining water to extinguish fires, that the attention seldom or ever reverts to any other.

Would the inhabitants of a district, on the first outbreak of a fire, promptly and zealously bring out their store of water (little though it be,) so as to enable *one engine* to be speedily brought to bear upon the rapidly spreading flames, many a time and oft the fire would be extinguished, and the threatened dangers averted long ere the arrival of the more copious though dilatory supply.

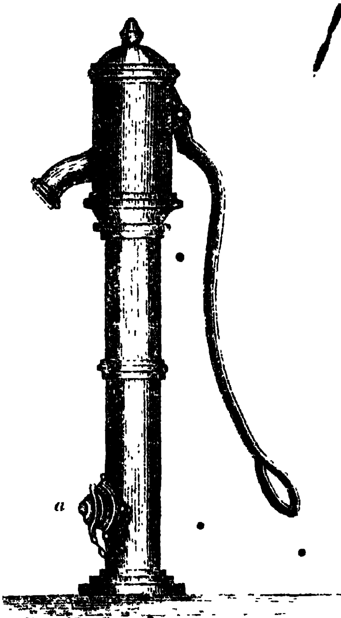
That any indisposition to part with water at such a time should exist, is the more extraordinary, because the cisterns, &c., are sure to be re-filled as soon as the water can be turned on; and being left without water for something less than an hour can be no great inconvenience, whereas the unchecked progress of the fire in that time might be most calamitous.

It sometimes happens that the proximity of a street pump affords a limited quantity of water, and when a small engine is on the spot the water thus obtained may be, and frequently has been, most advantageously employed. It is quite impossible, however, from the limited size, &c., of the pump barrels, to raise water enough by this means to keep an engine going, of the power now usually employed in the metropolis.

In the districts south of the Thames, where the deficiencies of the water supply have hitherto on many occasions been most severely felt, there are a tolerable good sprinkling of street pumps in various localities; many of them belong to the commissioners of the roads, and are (most illiberally) kept locked up in the summer time, so as to be exclusively

available for their purposes of road-watering; in the winter months the buckets are drawn out and the handles removed. Now, at a trifling expense, each of these pumps might be made most extensively useful in case of fire; furnishing, as they would, an abundant and instantaneous supply of water.

For this purpose, let a hole about 2½ inches diameter, be cut in the lower part of the pump barrel, below the range of the bucket, and attach by means of bolts a female screwed socket corresponding with the male screws on the end of the suction-pipes of the brigade engines, which are all uniform. This orifice should ordinarily be closed with a male screw-cap, as shown at *a* in the accompanying sketch. In case of fire occurring



within any reasonable distance of a pump thus furnished, and water not being otherwise forthcoming, the cap is to be removed, and the suction-pipe screwed into the socket on the pump barrel, and its other end attached by its swivel screw to the engine. If the socket is beneath the lower valve it will be better, but if not (and this could not in some cases be managed without the employment of a descending pipe with two elbows) the bucket valve will remain closed and prevent the entrance of air from above, so that on working the engine a continuous supply of water would be drawn up the feed-pipe of the pump, which would in fact become neither more nor less than a continuation of the engine suction down to the water in the well. In this way an unlimited supply of water would be obtained, let the engine be worked ever so fast, from a source at present nearly, if not wholly, unavailing; and which, by a chain of engines, might prove serviceable at very considerable distances.

In the event of the valves of the pump not being quite air-tight, all inconvenience from this cause might be obviated by slowly working the pump handle, and so keeping the bucket in action. In winter on removing the bucket, a solid piston should be put in its place, so as to close the top of the barrel.

In all towns where a uniformity of engine screws prevails, this contrivance offers immense advantages at a very trifling expense.

Modifications, and arrangements suitable for making available other supplies of water which present themselves under a peculiarity of circumstances in different localities, might easily be devised; but the great misfortune is, that this is every-body's business, and therefore people will not give themselves the trouble to think about, much less co-operate in, any measure of such seemingly *extra-personal* interest.

I am, Sir,

Yours, respectfully,

WM. BADDELEY.

London, February 15, 1841.

URWIN'S STEAM ENGINE IMPROVEMENTS.

Sir,—I observe in your journal of the 13 ult., a communication signed "Alpha" questioning the merit of my improvements in steam engines. Your correspondent states that he has devoted much time to the consideration of the expansive principle, in his praise of which I cordially agree with him. He must therefore be aware that the means used to carry the same into effect are common to all engines more or less, and that it is left entirely to the discretionary judgment of the engineer to give whatever

cover he may think fit to the slides. Neither does he require to be told that to effect expansion to any extent he must adopt a valve or slide to cut the steam off at any period of the stroke. The latter plan (which is that I have followed) is decidedly superior to making a great deal of cover on the slides, which diminish as the power of the engine when it is most wanted: namely, in starting a vessel or contending against a head sea and wind (as I have more than once experienced), while at the same time probably steam was blowing off. Whatever advantage, therefore, "Alpha" can claim for working expansively belongs equally to my improved system, with the best plans followed by others, while in addition, the steam is worked over again in the manner set forth in my specification. "Alpha" states the advantage to be derived by adopting the expansive principle to its fullest extent, yet according to his own account there is an effect of 20 pounds which he cannot make any use of, after it has forced the piston down. Now, by my improvements this last effect is made fully available for working purposes. I think it would not be a difficult matter to prove to "Alpha," that I produce almost as good an effect with the said excess of steam after he has done with it, as is produced previously—though perhaps by a different process of reasoning to that of "Alpha." For when he calculates the effect in the receiver, he forgets to consider that there is steam at *all times* in it. My method has also the advantage of reducing the dimensions of the air pump required, very considerably. "Alpha" complains of there being a "complicated addition" to the steam cylinder, but as you justly observe, nothing can be more simple.

I am led on the whole to believe, that "Alpha" has not given my improvements a fair consideration. The easy and simple manner in which they are effected renders them the more valuable, that they can be applied to any steam engine at a trifling expense. Trusting that your correspondent will reconsider my method and also revise his own calculations, which he will find not in strict accordance with truth,

I am, Sir, your obedient servant,

ROBERT URWIN.

SMOKE NUISANCE.

Sir,—The intolerable nuisance of smoke seems to continue as rife as ever in the metropolis, and in all towns where manufactories prevail. The result of several recent inventions would reasonably lead us to expect a speedy abatement of this crying evil, and we are glad to find, among others, the following proof of the confidence of his agents, in the smoke-preventing plan of Charles Wye Williams, Esq., patented last year, and an account of which will be found in the *Repertory of Patent Inventions* for March. In the *Liverpool Mercury*, for Jan. 22, a letter occurs from Mr. Armstrong, of Manchester, author of a work on "Steam Engine Boilers," and of which we annex a copy, as explanatory of the letter in answer to it which immediately succeeds:

(To the Editor of the *Liverpool Mercury*.)

Sir,—Observing in the *Mercury* of last week, a petition to the Mayor and Town Council for the suppression of a nuisance arising from the smoke issuing from a steam engine chimney belonging to the Liverpool and Harrington Water Works Company, and as it is more than probable that the company have at least tried some of the thousand and one plans of what is called burning smoke, without success, I beg to suggest to the parties concerned the expediency of trying to destroy the smoke by the application of a shower of water. A method of effecting the destruction of smoke on this principle was invented and patented a good many years ago by the late Mr. Jeffreys, of Bristol, and of which a drawing and specification may be seen in the *Repertory of Patent Inventions* for September, 1825, as well as an interesting paper on the subject by the inventor.

The plan is to erect a new chimney-shaft close against the ordinary one, but not so high. On the top of this new shaft, which, in the language of miners, may be called the "down cast shaft," a water cistern is placed, having its bottom perforated with a number of small holes, like a cullender, so that when it is supplied with water a continuous shower is produced, which is allowed to escape by an outlet at the bottom. Near the top of the old chimney, or "up cast shaft," is placed a damper, or other means of closing its orifice at will, and in the same shaft, a little lower than the level of the bottom of the cistern, an aperture is made in the wall which divides the two shafts, large enough to allow the smoke to pass from the "up cast" to the "down cast" shaft; this aperture also requires to be supplied with a damper. Now

you will already see that the mode of operation is extremely simple, the cistern being supplied with water by the engine, a strong draught is created by the falling shower down the new shaft, the top of the old flue being closed and the communicating passage open, of course the smoke is drawn forcibly through the latter into the "down cast shaft," where it is condensed, drawn down, destroyed and dissipated, by being allowed to run off into the main shore, or other convenient receptacle, as so much sooty water.

I am prepared to answer all objections that I have yet heard made to the feasibility of this plan of preventing smoke. Its great advantage is, that, by a proper disposition of the dampers, it does not preclude the use of the chimney in the ordinary way, and, therefore, cannot possibly interrupt the working of the engine, should the supply of water at any time fail, a quality of which Mr. Jeffrey's original plan was deficient. It has also this great advantage over all plans of smoke *burning*, that instead of injuring the draught of the furnace, which they all do, it improves it. Moreover, this plan involves no alteration whatever in the furnace or boilers, (a rock on which many a clear theoretical engineer has struck,) and, consequently, a properly-contrived apparatus on this principle is extremely applicable to steam-vessels, particularly to the river steamers, the smoke from which is becoming a daily-increasing nuisance.

My principal object, however, in availing myself of your valuable columns, is to direct the attention of those interested in the matter to the propriety of adopting this method in all cases of engines belonging to water works, where the cost of supplying water for the purpose must be so trifling. The Manchester Water Works Company do not require the use of steam-engines, otherwise I have reason to know that this or some other similar plan would have been adopted by them some years ago.

As there is now no patent monopoly in the case, Mr. Jeffrey's patent having expired some years ago, the mere cost of the suitable erections and apparatus could not, I conceive, be reasonably put in the scale against the comfort and cleanliness of the habitations of so large a portion of the population of Liverpool as are daily exposed to the nuisance complained of. Although it is hardly necessary, yet, if required, I shall be happy to furnish a drawing of my plan *gratis* to those who might be desirous to have it put into execution, and, therefore, add my name and address,

R. ARMSTRONG,
Civil and Mechanical Engineer,
Victoria Arches, Manchester.

Jan. 12, 1841.

This letter was promptly replied to, by Mr. Dircks, of the firm of Messrs. Brocklehurst, Dircks and Nelson, Liverpool, in the same paper, for Feb. 5, in the following terms:—

(To the Editor of the *Liverpool Mercury*.)

Sir,—I observe, in your last week's paper, a letter from Mr. R. Armstrong, of Manchester, particularly addressed to the Harrington Water Works Company, suggesting the adoption of Jeffrey's mode of suppressing the nuisance from smoke by means of a shower of water. The patent for this invention expired last year, and the monopoly being now removed, it is offered as the most available means for destroying smoke.

This plan contemplates the "building of a new chimney shaft, close against the ordinary one, but not so high," and placing a cistern on the top of this new shaft, which is to be kept supplied with water, a matter of no small difficulty at such an elevation. The smoke issuing from the furnace below, after having ascended nearly to the summit of its own proper chimney-shaft, is drawn into the new one by the action of the water showered down from the cistern above, and so, becoming mixed with the water, is to be "run off into the main shore," (sewer).

Now, Sir, without discussing the merits of this elaborate and expensive mode of getting rid of the smoke, had Mr. Armstrong paid a little attention to the chemistry of combustion, and the production of smoke, he would have seen that Jeffrey's plan involves the entire loss of the combustible carbon and gases, as heat giving bodies for the use of the furnace.

It certainly is a more natural and rational, as well as a more economical mode of producing, to effect the entire combustion of those elements of which smoke is formed, thus converting them to useful purposes, rather than, after allowing the smoke to be formed, to have the trouble and expense of destroying it.

That the chemical principle is the only true one on which to proceed cannot be doubted by any one who has studied the treatise "On the Combustion of Coal, by Charles Wye Williams, Esq." or who has heard him, in his course of lectures lately delivered here, explain the chemical conditions on which smoke is formed. In erecting Mr. C. W. Williams's furnaces, my mode of proceeding, then, in conformity with his suggestions, is to *prevent the formation* of smoke, and thus, by *removing the cause*, to remove the effect also; and the difference between a torch and an Argand lamp affords a familiar illustration of the difference that exists between the common and the patent furnace.

Adopting these principles, I have been enabled to prevent the formation of smoke,

at the same time effecting the complete combustion of the gases from coal. I shall have great pleasure in enabling any of your readers to satisfy themselves of the truth of the same by an examination of my furnace on the construction already mentioned, and no one can be deceived in the results, or the mode in which they are produced.

Whether Jeffrey's plan has been adopted in Manchester with success I do not know, but that it has been unsuccessfully tried in Liverpool I am certain. If Mr. Armstrong will erect *one* furnace, free of cost, in the way he suggests, but with the advantage of his receiving *all* the amount of the saving of fuel accruing from it, I will undertake to erect any number of the patent furnaces, with the difference of requiring only *one-third* of the savings, for a limited period!

Yours, &c.,

HENRY DIRCKS, Engineer.

Etna Foundry, Liverpool, Jan., 1841.

It appears from the enquiries we have made, that the agents just named, have one of Counsellor Williams' furnaces at work on their own premises with perfect success. The furnace is less than on the old construction, with the advantage of keeping up the steam better; there is no loss, the principle being not a mechanical, but a perfectly chemical one, the carbon and the lightest gases produced being burnt behind the bridge, and immediately under the boiler. By means of spy-holes, the effect of the old and the new construction can be directly shown to the conviction of the most sceptical, the same furnace being capable of placing the two modes in juxtaposition. This truly scientific principle is being applied to several large furnaces, and is found to answer admirably, according to the statements of the agents for land or marine boilers, and is also applicable to locomotive engines. The saving of fuel is very great; it is spoken of as being above 25 per cent. on the usual consumption. Mr. Williams' agents, therefore, confidently warrant a saving of 10 per cent., which alone is a material object where a large amount of engine power is employed; it is indeed the principle on which they urge its adoption, its prevention of smoke being only a consequence, and not the chief object sought. H. D.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—The plan of "J. S. K." (page 133) for preventing injury from the collision of railway trains, is open to many serious objections. Setting aside the heavy cumbersome appearance of the frame buffer, which *would* be of some importance, notwithstanding the honest opinion of "J. S. K." that it is not for directors to object, the invention cannot be depended on—it possesses no certainty and therefore is impracticable.

The cases of collision are of two kinds; first, as regards a train made stationary by accident or necessity, and secondly, as relates to advancing trains, on the same line of rail.

Now with respect to an overturned train, it is evident that the buffer would be liable to jerk, either above or below, a part of that train, and with the leverage of 14 feet merely perform the admirable manœuvre of lifting from the rails its own locomotive. When it meets with a standing train, the buffer may be of more service, but only to its own train, and this, provided it acts precisely as its inventor wishes (which is questionable), yet how will the stationary train fare? Will it not at the first percussion, have to bear a shock compounded of the weight and speed of the moving train, which shock is afterwards to be lessened by the rope and wire-work! The reflection would be anything but consoling to the injured of the standing train, that, although broken and battered they were not run over.

With respect to the second case, the two locomotives when they meet, would be the length of two buffers apart, that is 28 feet. Supposing they possess a momentum of 35 tons each, this would be doubled at the moment of collision, and upon bars 14 feet from any support! Would not either of the following effects take place, especially if the cross pieces do not meet in the same plane—a break or bend in the bars themselves, or a springing of one buffer over the other, and the consequence in either case an overturning of the trains.

If instead of being trains, equal in momentum, they differ, the greater would run down the less with its original momentum, minus that of the less—by no means fair play.

I hope a little sober reflection will show "J. S. K." that the ropes or wires are more likely to jam the bars in their sockets, than to be governed by springs and so forth—that there would be difficulty in adjusting the number and size

of ropes to the weight and velocity of the train, no light matter when the alterations in speed and weight which take place during one trip are considered—that the machine would be disabled for the rest of the journey after one collision—that the series of blows would tend to displace, or injure the engine, and that the ugliness and roughness of the contrivance, would spoil the symmetry, and we may add the beauty of that grand monument of human ingenuity, the modern locomotive.

We must ever bear in mind, that the perfection of all invention is instant and constant efficiency; not what *may* answer at a certain time, but what *shall* answer at *all* times.

I should not have extended this paper to its present length, had I not felt the vast importance of applying perfect and certain machinery in all cases where a number of human beings are concerned. They who desire to persuade a community, to the adoption of contrivances, which affect its convenience or its safety, should consider well the responsibility they rest under; for their plans may be adopted—their suggestions may be carried out, and theirs is the blame if, after trial, their bright lucubrations are discovered to be, nothing more or less, than the *ignes fatui* of invention.

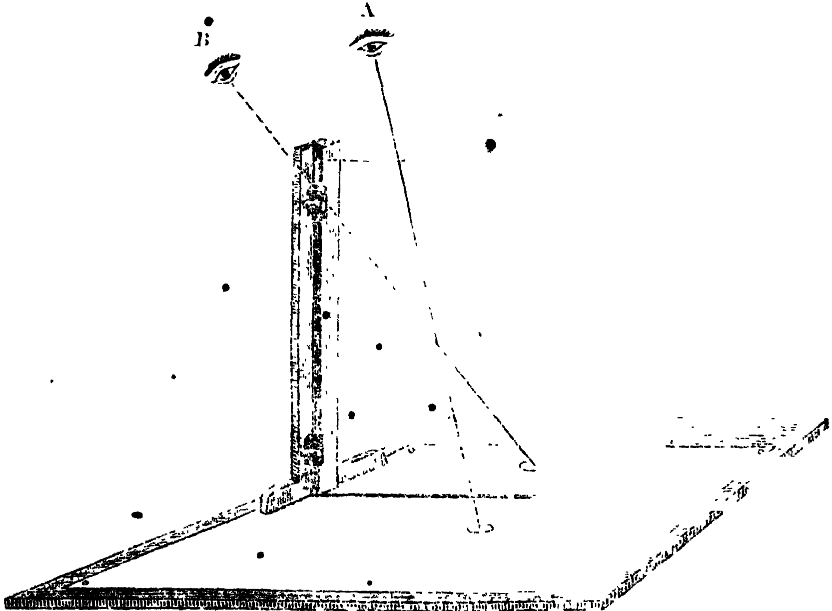
Yours obediently,

E. B. W.

Rotherhithe, Feb. 16th, 1841.

NEW OPTICAL DRAWING INSTRUMENT.

Sir,—As the instrument of which I inclose a sketch, may be found useful to some of your readers, I beg leave to put it at your disposal. Something similar was suggested to me some years since by the Rev. Mr. Taylor, of York, but it had escaped my memory until lately, when looking at some plants confined in a frame of plate glass, I was struck with the vivid images of the plants reflected *from* the bright plates, at such an angle as permitted vision of objects *through* them, this recalled Mr. Taylor's suggestion, and showed him it might be made available for copying natural flowers and other small objects.



The sketch represents a pane of thin mirror plate, held upright on a drawing board by a wooden frame in which it is fixed by two wedges. The person using

it places himself on the same side of the board with the wooden upright, the object to be copied is then placed on the drawing board near the pane of glass on the left-hand side of it, when the eye of the draftsman, if duly placed (as at A) on the left side of the plate, will see the object by reflexion, as if situated on the paper on the right-hand side of the glass; and a pencil held in the right hand may be seen at the same time through the glass, and may be employed in tracing the image.

Some attention is required in selecting a favourable position for the apparatus in respect of the illumination of the object, and its admitting only such a degree of light to the paper on the right-hand side of the glass, as may give sufficient distinctness to the point of the pencil, by which precaution the reflected image is seen to most advantage.

It must be recollected, that the delineation will not represent the original object as beheld by direct vision by an eye placed at A, being that of a reflected image, similar to what would be seen by direct vision, if the eye had been situated at B.

Your obedient servant,

K. H.

USE OF THE BLOW PIPE.

Sir,—I was much pleased to read Mr. Baddeley's remarks, in which I quite agree with him (page 66, *Mec. Mag.*, Jan. 30, 1841,) in reference to the real use of the numerous adaptations to the blowpipe, with a view to ensure safety in the combustion of the mixed gases—oxygen and hydrogen. As it would appear, that Mr. Baddeley has been in the habit of seeing, or using the blowpipe apparatus, I would—as personally unknown to him—beg the favour to request, that he will give your readers some information on points connected with the manufacture of these gases in a large way.

Purity of oxygen is it essential?—The black oxide of manganese of commerce, in being roasted, evolves a larger or smaller quantity of carbonic oxide, or carbonic acid gas, and rising with the oxygen, this prevents its being used when purity is required. The oxymuriate of potassa, I believe, affords the purest oxygen; but, I also believe it to be the most expensive substance. For the use of the nitrate of potassa there are objections from the great liability to explosion of the retort.

I would therefore ask, what are the means used to generate oxygen, for purposes where absolute purity is required, and when used extensively, as in exhibitions of the "Drummond Light," &c.? What conditions are necessary to keep the oxygen free from contamination? If the black oxide of manganese is the substance, what are the districts from which the best is derived?

With reference to the other gas—what is the best and most ready means of producing hydrogen? Of course any communication will be rendered more valuable if containing any hints as to what should be the cost of producing the gases in large quantities.

Apologizing for this intrusion, I am, Sir, your most obedient servant,

"Ὕδωρ."

Bath, Feb. 13, 1841.

FINE IRON CASTING—AN ENQUIRY.

Sir,—Will any of your intelligent correspondents be kind enough to inform me the best method of obtaining sharp ornamental castings in iron—equal, if possible, to the Berlin work. I have been to a considerable expense in obtaining the best founders, the purest metal, and the finest sand I could procure—still I have not succeeded to my wishes.

Remaining, Sir, yours respectfully,

AN OLD SUBSCRIBER.

London, Feb. 3, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

THOMAS ROBINSON WILLIAMS, OF CHEAPSIDE, GENTLEMAN, *for certain improvements in measuring the velocities with which ships or other vessels or bodies move in fluids, and also for ascertaining the velocities of fluids in motion.* Rolls Chapel Office, February 27, 1841.

For river navigation, where the cargo is not liable to great fluctuation in weight, and the perpendicular height of the vessel as regards the water line, or the horizontal line, or evenness of keel, is less disturbed than in sea navigation, the patentee uses a bent tube (copper being preferred) inserted either through the stern-post or keel, or by the side of either of them, and passed down the stern-post to near its heel; and then bent backward, *i. e.* in a direction contrary

to the bows or head of the vessel, and made to point rather below or under the rudder, projecting but a short distance from the stern-post, according to its size, it should be merely of sufficient length to be clear of the dead water behind the post or heel; this end is left open to the water. The inner end of this tube is then bent upwards through the floor of the cabin, where there is a float bob of light hollow glass or metal, with a rod attached, is provided, with a scale similar to a common steam-gauge, &c. Or when the water line is not inconveniently low, a strong glass tube is made to form the upper part of this tube, including the water-line, *i. e.* the point to which the water will rise when the vessel is not in motion; this then becomes the zero point of the scale; and with whatever velocity the vessel sails in a forward direction, producing a partial exhaustion of the water from this tube, or a depression of its surface therein, and consequently indicating the speed of the vessel, &c. with great accuracy.

In another case, the inventor attaches to this main pipe a bent glass tube or inverted syphon, one of its upper ends being connected with the main, the other being open to the atmosphere; this bent tube being partly filled with mercury, and having a scale attached, of course indicates the velocity of the vessel by the surface of the mercury being depressed in the proportions of the weight of mercury to that of water.

To remedy inconveniences from fluctuations in the weight of the cargo, the patentee employs a water cistern, one, two, or three feet square, and of a sufficient depth, placed in the most convenient situation, and as near midships and over the keel as possible, having small and safe external communications through the vessel, into which the water may flow in and out, that its surface may always correspond with the external water-line. Within this box or cistern, another flat, hollow, metallic, or other body, is made to float, but so as to sink considerably below the surface of the before-mentioned cistern. Through the bottom of this float is firmly soldered or fixed, either the single or bent tube, with its scale, which is connected by an india-rubber or other flexible tube with the main.

Another apparatus, which has been found to answer for sea or river navigation, whether by wind or steam, and all general purposes, exceedingly well, consists of an instrument suspended in gimbals, in any convenient part of the vessel, and a plummet and drag chain or line to be towed overboard and attached thereto. An iron cylinder or chamber, of about 1¼ inch internal diameter and 18 inches long, is connected by a small bent tube, with a glass tube, having its upper end open to the atmosphere. A hollow glass or other plunger, with its bottom end closed, is made to slide very freely within the iron chamber. The apparatus is secured to the wood-work of the room or cabin by a standard. Within this standard there is a finely-adjusted pulley, and a corresponding pulley at the lower part of the machine. An ear or staple projects from the cup of the plunger, to which a strong flexible cord is attached, passing down under the lower pulley, then up over the top one, and thence to the plummet or drag line. A scale is affixed to the glass tube graduated in knots per hour. Mercury is poured into this inverted syphon till it rises to the zero line of the graduated scale; the plunger being in its place, and floating at liberty upon the surface of the mercury. When the cord is pulled, the column of mercury in the glass tube will rise by the descent of the plunger, to a height proportionate to the degree of tension exerted.

The drag to be towed overboard for occasioning the resisting power (which resistance will always correspond with the velocity of the vessel,) and operating upon the instrument before described, may be of various kinds and shapes. In some cases the patentee has used merely a plain-braided rope of 100 feet or more in length, and the size of a common log-line, which is to be saturated with India rubber, &c., to prevent wear. This plain rope is preferred for measuring currents or small velocities, and in shallow water. In other cases, he has used a plummet of glass or metal in the shape of a pointed cylinder: when this is used, only half the length of line is necessary. But he has found the most uniform and steady in action, and recommends as best in practice at sea—a smaller line of about ¼ inch in diameter, and 200 feet long, having a number of conical or egg-shaped plummets of metal, glass, or ivory upon it, at the extreme end from the ship about 3 feet apart. Twelve of these plummets on a line of this length, at the speed of ten knots per hour, indicates a pressure of 6 lbs. avoirdupois upon the pound and ounce scale of the instrument; which scale is intended to facilitate the proving and adjusting the instrument. This instrument is also made to serve another valuable purpose—that of showing the trim of the vessel; its perpendicularity being always preserved by its manner of suspension, and terminating at the bottom in a narrow point. A strong table is placed immediately under it, having upon its surface a metal plate horizontally secured when the vessel is in perfect trim as to stem and stern, as well as crosswise, or otherwise the best-determined position for sailing. This plate has a centre point, precisely under the point of the instrument, which is as near the plate as pos-

sible without touching it; the plate being suitably divided, shows at all times the degree of inclination (if any) of the vessel from the perpendicular, or previously determined best sailing position.

Another form of instrument for a like purpose, which is more conveniently used from the deck is the following:—within a frame, or bed of the instrument, a barrel, or arbor, is supported centrically upon an axis, around which the towing line is coiled once or twice and secured; a weight is attached to, and hangs from the barrel, having a constant tendency to keep it in a perpendicular position. A card or scale is mounted on the same axis as the barrel, but moving quite freely and independently of it, and constantly kept in one position by fixed pendant weights. An index wire attached to the barrel passes over and across the scale, which is graduated into knots per hour. Both the index and scale, by the action of gravity become self-adjusting, the former when undisturbed, standing at the zero of the scale; but when the barrel is partly turned by the tension of the towing line, being dragged through the water, the index traverses the scale and indicates the velocity due to that tension. The claim in the first-described apparatus is to the general arrangement, and especially the reversed open-mouthed tube, as well as the double water cistern. And in the second and last, to the general arrangement of the instrument, together with the towing plummets conical or otherwise, or a number of towing plummets—a flexible rope saturated with India rubber or other adhesive material—a close flexible chain—or in fact the towing of any body after or from a vessel for obtaining a resistance (not rotary) for operating upon the herein-described instruments, or any other weighing instrument which might be used herewith on board of vessels for ascertaining their velocities, or by the same means in fixed positions for ascertaining the velocities of currents whether they be in water or other fluids.

Hugh Unsworth, of Blackwood, Lancaster, Bleacher, *for certain improvements in machinery or apparatus for mangling, drying, damping, and finishing woven goods or fabrics.*—Rolls Chapel Office, Feb. 27, 1841.

These improvements consist, firstly, in a certain combination or arrangement of mechanism or apparatus, whereby all the processes enumerated, may be performed in one machine, instead of being separately effected by distinct machines or processes as heretofore done; and thus producing a much better "finish or condition" upon the calicoes or other fabrics, and also greatly economising hand labour. Secondly, in passing the cloth after it has been once dried, again partially through the mangling or calendering portion of the apparatus, and in contact with the wet cloth, in order that the dry cloth may thus be damped or "conditioned," which necessary process in finishing woven goods or fabrics is now usually performed separately by a damping machine. Lastly, in the application of a drying cylinder to the ordinary mangling or calendering apparatus, thereby rendering that machine much more effective in its operation upon the cloth in those instances where these improved combinations of machinery are employed for mangling only, and not for the finishing process.

The main framing or standards of this machine support a set of ordinary mangling or calendering bowls or rollers (composed as usual, some of metal, and others of cotton or paper) bearing in stops or pedestals, and also a large drying cylinder, heated by steam, supplied through its axis in the usual manner. A set of auxiliary drying cylinders are also provided, and mounted in a frame opposite the machine, furnished with tension or guide rollers, and used wherever the one steam cylinder is found insufficient, as in the mangling process only. The machine is provided with heavily-weighted levers and connecting links, for increasing the pressure of the mangling cylinders, and dispelling the greater portion of the moisture in the first instance, as the cloth enters the machine, passing over the distending or stretching bars. There is the ordinary weighted leverages applied to the upper calendering rollers, and also the usual lifting bar, with its rack and pinion, to be worked by a winch handle, for raising the two upper rollers when necessary.

The operation is as follows:—The wet cloth, as it comes from the squeezers, after bleaching or any other wet process, is placed upon a table, and first guided by the hands of the attendants over and under the stretching-rails, and passed between the two lower mangling rollers, where great pressure being applied, as before stated, it is ready to proceed immediately around the drying cylinder, when it may be only partially dried, and passing onwards is submitted to the upper calendering bowls, and over the other drying cylinders, when the dried cloth is again passed into the machine at the back, proceeding from the surface of the lowest drying cylinder through the calendering bowls a second time, and in contact with the wet or only partially dried cloth, and thus receiving the operation of damping by such contact only, instead of being damped separately by another machine as heretofore done; this damping and finishing operation being thus much better performed, and the "condition and finish" of the cloth materially improved. The cloth, when finished, is wound upon a roller in the usual manner.

CHARLES SMITH, OF EXETER, BUILDER, *for improvements in the manufacture of lime and cements or composition.*—Enrolment Office, February 27, 1841.

My "invention," says the patentee, "relates, first to a mode of calcining lime, or cement, or composition, for such like purpose, by having the kiln so formed, that the charge in the upper part of a kiln shall be calcining while the charge in the lower part thereof shall be cooling, and in cooling the heat and vapours therefrom shall pass to the charge in the upper part.

2. To a mode of calcining lime, &c., in ovens, in such manner, that the calcined products are drawn into a close chamber to cool before being drawn into the atmosphere; and the carrying the gases or vapours so as to apply them to useful purposes.

3. To employ the heat which passes away from lime kilns to the purpose of evaporating fluids.

4. To a mode of slacking lime, by means of carbonic acid gas in a suitable chamber.

5. To re-calcine lime that has been previously calcined and dry slacked.

6. To a mode of treating lime-stone by partially calcining it in a kiln, or oven, to convert it to a subcarbonate, and cooling, then grinding, and again calcining in ovens; whether separately or combined with other matters used in making cements.

7. To a mode of making cement by saturating sulphate of lime with ammoniated and other liquor.

8. To a mode of combining lime and cement with ground calcarious earths and stones, in substitute or in aid of silex and other matters.

9. To a mode of combining lime for use by applying soap.

10. To a mode of combining water with lime and oil, with or without other matters, so as to form a cement.

11. To a composition and formation of tiles or slabs to supersede laths and other purposes.

Lastly, To a mode of hardening articles made of lime and cement and calcarious stone or earth, &c., by placing them in a chamber with carbonic acid."

The form of kiln, by which several of the processes embodied in this patent are to be performed, consists of an upright shaft to which flues are admitted about half-way up; these flues may be those from furnaces built in the kiln for this purpose, or they may be the flues from coke ovens, or the furnaces of soda works, or any other source of heat that would otherwise escape into the atmosphere and be wasted. In first using this kiln, a quantity of brushes, wood, shavings, or other combustible matters, are to be placed at the bottom of the shaft and the charge of limestone placed above; a door at the bottom is to be left open so as to admit a sufficient quantity of air for the purpose of ignition. As soon as the charge as far up as the flues has been calcined, heat is to be aumitted from the flues and the lower door closed and luted; by this means, while the charge in the upper part of the kiln is being calcined, the heated gases, &c., from the lower portion will ascend in aid of that operation, leaving the lowest part of the charge cool, ready for extraction, which is to be partially done about every six hours, a fresh quantity of materials being supplied at the top of the kiln. By this mode of conducting the process it is stated that the products will be better and obtained with a much less expenditure of fuel than at present. No coke or fuel has to be charged into the kiln with the limestone, unless it is desired to quicken the operation.

One of the ovens attached to the kiln, the flue of which aids in the before-mentioned calcining process, is so constructed as to be charged from a chamber above, while the floor has an aperture, opened at pleasure, communicating with a chamber or vault below; by which means the calcined products can be thrown down and cooled previous to extraction. A pipe is also affixed on the upper part of this oven by which any gases or vapours given off, pass down to a refrigerating vessel and are condensed.

As in the ordinary mode of calcining lime much heat passes into the atmosphere and is lost, the patentee proposes to take advantage of this heat and apply it to the evaporation of fluids; for this purpose a large boiler mounted on wheels runs upon a pair of rails so as to cover the top of the kiln, whilst a horizontal flue which carries off the hot vapour, &c., of the kiln, is covered by a long tank or cistern in which evaporation can be continually carried on. At the end of this horizontal flue there is a trap-door, opening into a capacious chamber below: when this trap is opened, the direct communication with the chimney is shut off, so that the carbonic acid from the furnaces (the smoke being entirely consumed in passing through the heated mass) fills this chamber, wherein lime being placed is effectually slacked. When the lime is thus slacked it becomes a subcarbonate and is to be taken out and carried to the oven to be re-calcined, which will be effected in about four hours: it is then shot into the vault to cool; after which it is to be finely ground, and if not wanted for immediate use, should be packed in casks; this process gives to the lime a strong setting quality without the risk of what workmen term blistering. In order to give to lime a greater *sodifying** (query, solidifying) quality,

* This verbose and ill drawn specification, which occupies six skins of parchment, and is accompanied by four sheets of drawings, abounds with orthographical and grammatical errors.

the patentee adds to each bushel, previous to the second calcination, about a peck of finely ground forge clinkers, or burnt aluminous earthy matter, or the scoria or slag of a smelting furnace. This quality is also given to compound carbonate of lime, when broken into small pieces, and at once wholly calcined in the oven, and subsequently cooled in the vault, only that it requires a longer time (12 hours) for its calcination; this may be expedited, however, by a small current of vapour introduced through a suitable pipe with valves, &c., to regulate its admission at pleasure. And all natural cements or artificial mixtures of calcarious magnesian or other earthy oxydes or salts *is* much improved when prepared in the manner described. Highly hydraulic or compound lime, when calcined and cooled in this mode, may be ground and sifted immediately for use. Calcareous stones in pieces not exceeding 1 lb. each are put into the oven and calcined for only half the time requisite for perfect calcination (6 hours) so as to convert them into a sub-carbonate, they are then dropped through into the cooling vault, and when cold are ground; and if for external work are to be mixed with one-fourth of finely ground clinkers, &c. &c. The patentee forms a cement from sulphate of lime or gypsum and such like calcareous earths, "or any moulds or things that *has* been made from Plaster of Paris of Commerce, and grind *it* to a *power*" (query, powder) or break it into pieces that will pass through a sieve of ¼ of an inch mesh; these are calcined till all the water of crystallisation is driven off; when cooled and ground, the matter is placed in a cistern or tank, and is covered with purified liquor prepared from the ammoniated fluid formed in the manufacture of coal gas—purified human urine—distillation from bones, or other similar matters, all tarry or extrinsic matters being previously carefully separated. When the liquor is absorbed (in 48 hours) the composition is to be dried in the oven, and then about one-fifth of dry lime in powder is to be added to it, and if thought proper a similar quantity of calcined magnesia.

In combining lime and cement for use, the patentee takes portland purbeck marble, or other hard calcareous stones, and grinds them to different degrees of fineness, according to the nature of the work to be done. The gauging is then performed with two parts of ground stone to one part of lime or cement; occasionally adding a portion of ground clinkers, &c. &c.

To manufacture a composition or cemen, which admits of a colour being given to it with such a degree of uniformity as to represent any desired kind of stone, or in which may be produced representations of landscapes, figures, or imitations of marbles, two parts of the ground marble are to be mixed with one part of fine slacked lime, using the smallest possible quantity of water: this mixture is to be well tempered once or twice a day for three days. One pound of soap (best) is to be dissolved in six quarts of hot water, with two ounces of glue or other glutinous substance; the cement previously described is to be reduced to the proper consistence for working, with this liquor, and applied after the manner of stucco with hot tools. The form of tools best adapted for this purpose, as also a suitable stove for heating them, are duly shown.

Another cement is made by taking a suitable quantity of lime, and adding as much water as will bring it to a semi-fluid state; when half slacked a quantity of oil (equal to that of the water used) is to be added. When cool this mixture is to be strained and two parts of ground stone or marble added to it; or hard sand, or minerals, or metallic oxides may be employed. This composition is to be used like the former, and is very suitable for external work as it will not absorb moisture: if it is required to set quickly, plaster of paris may be added at discretion.

To form tiles suitable to be used instead of laths, three parts of good aluminous earth is mixed with one part of ground clinkers, &c., and made into tiles and burnt in the usual manner; one side of the tile is roughened to form a surface for the reception of the finishing coat of plaster, &c.

To harden articles made of lime, cement, or calcarious earths, they are placed in the carbonic acid chamber of the kiln already described, and are sprinkled occasionally with lime water, or a solution of sulphate of potash, or alum water, which being acted upon by the carbonic acid, communicates great hardness to the materials so treated.

The claim is to, 1. The mode of calcining lime or cements and compositions by means of kilns so formed that the charge in the upper part shall be calcining whilst the lower part of the charge is cooling, and in cooling, the heat therefrom passes up amongst the upper part of the charge of the kiln.

2. The mode of calcining lime and cements in retorts or ovens, when in connection with a closed chamber, wherein the matters can be cooled before being brought into the atmosphere, and also the carrying off the gases or vapours so as to apply them to a variety of useful purposes.

3. The application of the heat of limekilns to the purpose of evaporating fluids in suitable boilers or pans.

4. The mode of slacking lime in chambers with carbonic acid.

5. The mode of manufacturing lime by re-calcining after dry slacking.

6. The mode of manufacturing lime by

partially calcining lime-stones in a kiln, in order to convert it to a sub-carbonate, and after cooling and grinding, again to calcine it, whether separately or combined with other matters.

7. The mode of manufacturing cement by saturating sulphate of lime with ammoniated liquor or other similar matters, as described.

8. Combining lime and cements with ground calcarious earths or stones in substitute or in aid of silex or other matters.

9. The mode of combining lime for use by applying soap, with or without glutinous matter; and also the method or process of using hot tools for finishing and polishing cemented surfaces.

10. The mode of preparing cement from lime by means of oil and water, with or without other matters.

11. The combining calcarious earths and ground clinkers, or slags, or scoria, from the smelting furnace, and the forming and burning of tiles thereof, also the forming of tiles or burned rough surfaces, to be used as substitutes for laths, to receive cemented surfaces, as described.

Lastly.-The mode of hardening articles made of lime or cement and calcarious earths or stone, by placing them in chambers with carbonic acid, as above stated.

Charles Joseph Hullmandel, of Great Marlborough Street, Lithographic Printer, *for a new effect of light and shadow, imitating a brush or stump drawing, or both combined, produced on paper, being an impression from a plate or stone prepared in a particular manner for that purpose, as also the mode of preparing the said plate or stone for that object.*—Enrolment Office, March 2, 1841.

For effecting this purpose the plate or stone is first grained as for a chalk drawing; a polished plate or stone may be used if preferred, but a grained stone is recommended as being much more pleasant to work on. The drawing being completed on the plate or stone with ordinary lithographic ink dissolved in water, and with the use of a brush, or hair-pencil, or with a stump, it is prepared with an acid as is usually done with chalk drawings. After it is thus prepared and well dried, the plate or stone is placed in an inclined position and a solution of resin in a volatile solvent, such as is generally used in aquatinting, is poured all over the drawing. As the solvent evaporates, the resin cracks or retracts in the usual way, just as is the case in laying a ground upon a polished copper or steel plate previous to engraving in aquatint.

By this means the drawing becomes protected wherever it is covered by the resin, while all the numerous and minute interstices between the particles of resin are unprotected and exposed. The plate having been carefully warmed to set the resin firmly upon it, is to be exposed to the action of nitric, muriatic, or other acid capable of acting upon the stone, combined with gum water, in the proportions of one part of acid to six of gum water. The etching action of this acid on the exposed surfaces of the stone produces the "new effect of light and shadow," sought to be obtained by this process.

The following ground is recommended, having been used with much success by the patentee:—four ounces and a half of resin, and a quarter of an ounce of common pitch are to be dissolved in a quart of spirits of wine; after being well mixed, the mixture is to stand for three days, being strained it is then fit for use.

The claim is for a new impression or new effect of light and shadow, produced from a drawing so executed on a plate or stone as aforesaid, and then prepared for printing by etching after the drawing has been made. Also, the preparing the said plate or stone after the drawing has been made by covering it with any suitable ground that will admit by volatizilation and subsequent cracking, or by the removal of portions of the said ground, the action of the acid for the purpose of etching or biting it. The patentee also further claims the etching and biting of it as aforesaid, after the drawing has been mad for the purpose of obtaining the impression desired.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 28TH JANUARY AND THE 22ND FEBRUARY, 1841.

George Jameson Cordes, and Edward Locke, of Newport, Monmouth, for a new rotary engine. Sealed. January 28.

Samuel Hall, of Basford, Nottingham, civil engineer, for improvements in the combustion of fuel and smoke. February 1.

John Dickinson, of Bedford-row, Holborn, Middlesex, Esq., for certain improvements in the manufacture of paper. February 1.

William McMurray, of Kinleith Mill, near Edinburgh, paper maker, for certain improvements in the manufacture of paper. February 3.

William Henson, of Allen-street, Lambeth, Surrey, engineer, for improvements in machinery for making, or producing certain fabrics with threads or yarns, applicable to various useful purposes. February 4.

Nathaniel Lloyd, pattern designer, and Henry Rowbotham, calico-printer, both of Manchester, Lancaster, for certain improvements in thickening and preparing colours for printing calicoes and other substances. February 9.

James MacLellan, of Glasgow, manufacturer, for an improved combination of materials for umbrella and parasol cloth February 9.

John Clarke, of Islington, Lancaster, plumber and glazier, being a communication from abroad, and partly by invention of his own, for an hydraulic double action force and lift pump. February 9.

Charles May, of Ipswich, Suffolk, engineer, of the firm of J. H. and A. Hansome and Co., for improvements in machinery for cutting and preparing straw, hay and other vegetable matters. Feb. 12.

James Johnson, of Glasgow, North Britain, gen-

tlemen, for certain improvements in machinery for the manufacture of frame work knitting, commonly called hosiery, and for certain improvements in such frame work knitting or hosiery. Feb. 15.

George Holworthy Palmer, of Surrey-square, Surrey, civil engineer, and Charles Perkins, of Mark-lane, London, merchant, for improved constructions of pistons and valves for retaining and discharging liquids, gases, and steam. Feb. 16.

Miles Berry, of 66, Chancery-lane, Middlesex, (a communication) for certain improvements in looms for weaving. Feb. 20.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, (a communication) for improvements in tanning, Feb. 22.

LIST OF IRISH PATENTS GRANTED FOR JANUARY, 1841.

R. E. Morrice, certain improvements in the arrangement and construction of ships' hearths or apparatus for cooking and for obtaining distilled or pure water from salt or impure water.

W. H. Burnett, improved machinery for cutting or working wood.

H. H. Bourne, a machine for cleansing highways.

J. Aunes, a new and improved method of making paint from materials not before used for that purpose.

NOTES AND NOTICES.

The British Queen.—We are informed, by a professional gentleman who last week made a thorough inspection of this vessel, and who is as competent a judge on the subject as any in existence, that, notwithstanding the great service she has seen, she is substantially in the same condition as she was this time last year.

Sulphur.—M. Regnault has noticed a curious fact, relative to sulphur, when solidifying, after it has been previously reduced to the state of a paste. It is known that sulphur, when kept in fusion for a certain time, changes its colour, becomes of a hyacinth red, and acquires the property of remaining soft for a long time, by plunging it into cold water. M. Regnault has observed, that sulphur, in this state, when submitted to a temperature of about 98 degrees (centigrade) in a stove, liberates a great quantity of heat in becoming solid, so as to raise the thermometer suddenly to 110 degrees. When the solidification is effected, the thermometer returns to the temperature of the stove, and there continues.

Liquefaction of Air.—M. Tillorier (the French chemist, in whose lecture room, at Paris, a recent explosion of carbonic acid gas took place, which killed M. Hervy, a very promising student) has undertaken the dangerous experiment of attempting to liquefy atmospheric air by pressure. The apparatus for this purpose has been nearly completed. To effect the liquefaction of air, he contemplates compressing it more than 2400 atmospheres, instead of 100, to which extent he carried his compression of carbonic acid gas.

Locomotive Power—Gain of 100 per cent. (! ! !)—An adjourned meeting of practical engineers and scientific gentlemen was held, pursuant to public advertisement, at Mr. Wheatley's, Junction Dock Tavern, on Monday evening last, Mr. Stead, civil engineer, in the chair, when a working model of Mr. Witty's new propelling engine, on the principles of gunnery, was exhibited on a temporary railway. Steam was applied, and, after the engine had made several trips, the company expressed their admiration in bursts of enthusiastic applause. The machine was afterwards examined very minutely, and the following data were established to the satisfaction of the gentlemen present:—First. By the intensity of the force of steam applied directly to propel the engine in a right line, agreeable to Newton's Third Law of Motion, the maximum of effect is gained. Second. That this application is contradistinguished from the usual methods of turning the wheels by the force of steam to propel in a straight line, and evidently proves not only the unnecessary complications, but the absurd interposition of the old method of rotatory motion, and at once demonstrates the loss of force by the present *round-about* application. Third. That by adopting the projectile principle, the motion is rendered much more simple and effective, and the expense reduced at least 100 per cent. Fourth. That in consequence of this invention, the intensity of force is removed from the axles or shafts of the engines, and safety is thereby ensured, so far as applied to the breaking of axles, shafts, &c., of locomotive engines, which is impossible in this invention.—*Hull Advertiser.* [Is not a gain of 100 per cent. the same as doing the thing for nothing? A discovery which can effect this must indeed be something new. Ed. M. M.]

Steam-Boat Collisions.—Sir,—Would it not be a preventive against such accidents if a law were made compelling steam-vessels to keep a gong sounding, say every five minutes, during foggy weather and dark nights, which might be easily done by machinery attached to the engine.

Yours, respectfully,

Portsmouth, Feb. 24, 1841. J. Sheppard.

Deaths from Fire in 1840.—By the returns from the city and liberty of Westminster, and the coroners of the city and the eastern division of Middlesex, it appears that during the last twelve months no less than 245 children have been burnt to death in those districts.—*Times.*

Metallic Relief Engraving.—Take a tablet of plaster of Paris, and, having heated it, apply wax for absorption to all the faces, save that on which you intend your drawing to be, and to that one apply your drawing, executed with lithographic ink, on lithographic transfer paper. Let the side of the tablet on which is the transferred drawing, be now dipped in weak acid and water and then permitted to absorb a solution of sulphate of copper. By electro-metallurgy a deposition of copper can be made on all parts stained with the sulphate. Ere this coating be too thick, let the tablet be removed from the vessel in which this last operation has been carried on, washed *carefully*, dried, and a mixture of isinglass and gin be poured on it; its redundancy be gently blotted off with blotting-paper till the surface be level (*i. e.* the copper lines and isinglass be of the same height); again, let the deposition take place, and again its succeeding operation, after which let common black lead be rubbed over the whole surface; and the deposition being renewed, a copper mould, from which a type metal block may be subsequently cast, is now formed. *Another method.*—Draw with a pen dipped in warm isinglass coloured cement, and when your drawing be dry, for an instant expose it to steam, and then coat it with leaf gold. Proceed by electro-metallurgy as in the last method, and no cast is necessary. *Correspondent of the Athenæum.*

Errata.—Page 81, first column, sixth line from top, *for gustous*, read gustory; same page, second column, eighth line from top, *for wien*, read there; page 85, first column, twelfth line from bottom, for sensation, colour is, read sensation colour, is.

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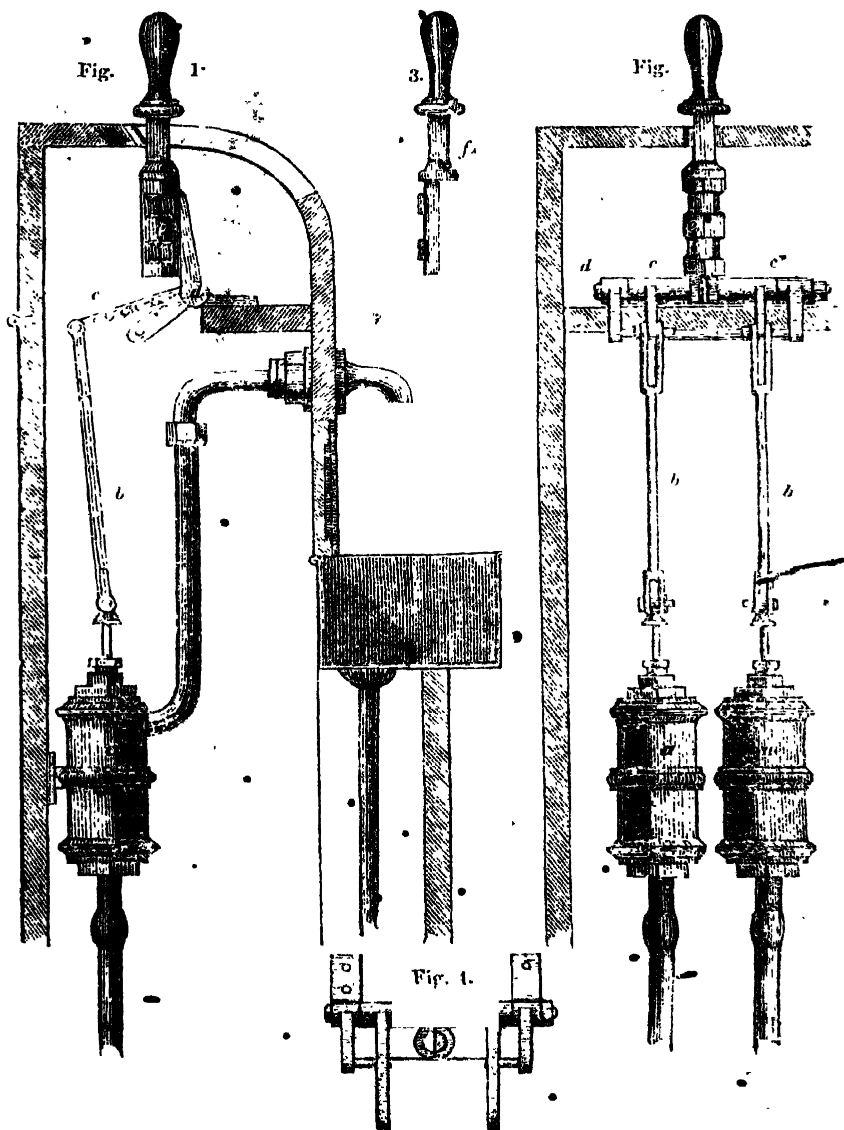
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ERNEST'S PATENT IMPROVED BEER ENGINE.



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Amongst the innumerable machines in general use, for every purpose of life and luxury, which have been devised, adapted, or improved, for the saving of time and labour, and the prevention of waste, none have remained more stationary, from the time of their introduction until the present hour, than those employed in every city, town, and village of the United Kingdom, for the drawing of malt liquors from the cellar in which they are stored, to the hand by which they are measured and vended. Merit is ever modest, and few devices, though of superior importance and greater renown, have effected more towards the purposes for which they were designed, than the little hydraulic machine which has obtained the well-known and well-established appellation of the "Beer Engine."*

The usual construction of these useful, indeed essential, appendages to the counter of every beer seller, requires but little explanation. They consist of a series of small lift and force pumps, (generally from four to six in number) enclosed within an ornamental case; each pump working separately from the others by a lever, which passes through a slot in the semicircular head of the case. To the upper end of the pump a pipe is attached, which conducts the liquor discharged to a nozzle in front of the case, whilst to the lower end is attached a suction pipe, inserted in the cask from which the beer is taken; and each pump is employed to draw a particular quality.

From the variations which malt liquors undergo with every change of temperature, it is requisite at all times to combine old and new beers together, in different proportions, to render them palatable. To effect this object, either two of the pumps must, on all occasions, be employed, or a mixture must be made up in the cask. In the former case, irregularities always occur in the proportions drawn; arising either from the negligence of the servants engaged, or the impossibility, in the hurry of business, of determining the requisite proportions of the draft, by the mere action of the hand. In the latter case, the intermixing of the beers, in different stages of soundness and acidity, occasions a new fermentation of the liquor, which thus becomes altered by its own internal action; it is also rendered peculiarly sensitive to the influences of the atmosphere, becomes unfitted for keeping, and unless speedily consumed is sure to be wholly spoilt.

To avoid these evils was the object of the patent which forms the subject of the present article.

The main principle of the invention is, the combination of a number of pumps, which being set in motion by a single lever, act together; thus simultaneously drawing liquors from two or more different casks, which are discharged through a double spout; the quantities being regulated at pleasure, in such proportions to each other as may be desired, by varying the stroke of either pump. By this means, the required mixture may be secured, without interfering with the casks in which they are separately contained, and without the risk of alteration in its proportions by any lapse of attention on the part of the drawer. Another of the objects designed, is to work or operate with one lever upon two several pumps, whether connected with, or independent of each other, and either together or separately, at the will of the operator; by which a saving of room is effected, and the variation or change from the one pump to the other, at the time of action, is invisible and unknown to any one besides the person engaged.

These objects have been most effectually attained by the present invention, which has received much approbation; and as the improvements can be applied to the engines in present use, with little trouble and at a very small expense, there is every prospect of their being generally adopted. The prefixed drawings will illustrate the method last mentioned. The plan previously referred to will from thence be easily understood, as that consists simply in connecting two of the pumps by a cross head, the levers from which to the pump-rods, are furnished with means of lengthening or shortening the lift of the pumps, and thus increasing or diminishing the quantities drawn in the regulated proportions.

* One of the many highly useful and ingenious contrivances for which we are indebted to the inventive skill of the late Mr. Bramah.

Description of the Drawings.

Figs. 1 and 2 represent an arrangement for drawing liquors from both or either of two casks at pleasure, by one lever, and also of varying the quantities drawn from either cask in any proportion.

a a, are two pumps, of the kind commonly used. The piston-rods of the pumps are connected by the links *b b* to the levers *c c*, each of which is free to turn independently of the other, upon the pin *d*; *e*, is a cylindrical socket sawn through its axis so as to form two semicylindrical halves, which are separately attached to the upper arms of the levers *c c*; *f*, is the lever or handle (shown separately in fig. 3,) the lower portion of which is made semicylindrical, to fit the socket *e*, and on the middle of the semicylindrical side are formed two studs, which work in two corresponding grooves in each half of the socket. When the studs engage the grooves of both parts of the socket, both pumps are moved simultaneously by the action of the lever *f*, and will deliver equal quantities, but if the handle be turned as far as it will go in either direction, then the studs are withdrawn from the opposite part of the socket; the pump connected thereto is set at liberty and is not moved by the action of the handle, whilst the other will alone be operated upon. Thus, by throwing the pumps out of gear alternately, and by pulling a longer or shorter stroke, the liquor may be drawn or mixed in any desired proportion.

In order to insure the ready connection of either portion of the socket with the handle, the levers, when out of gear, rest upon a pin passing from side to side through the projecting parts of the bearing. A mode of regulating the discharge from each pump in certain definite proportions exists by means of the holes in the arms *c c*, to either of which the links *b b* may be attached, and according to the distance of the point of attachment from the pin or fulcrum, will be the proportionate discharge of the pump.

When it is desired to preclude the person drawing from any discretion upon the proportions of the liquors to be supplied, the lever may be secured so as to engage both pumps at the same time, and the proper mixture only can then be drawn—or the other simpler method, before alluded to, may be employed.

The various parts admit of many modifications, some of which are specified.

Fig. 4, is a plan of the levers *c*, with their socket and resting pin.



ON THE NECESSITY FOR AN IMPROVED STATE OF PHILOSOPHICAL NOMENCLATURE.

Sir,—Matter is found to exist under three distinct modifications or forms, viz., the solid, *(concrete)* the fluid, and the aeriform *(gaseous)*; these states seem to depend upon the quantity of an agent (to which chemists have given the name of caloric) which enters into combination with the particular substance. Water affords one of the most familiar illustrations of these changes, in its three states of ice (concrete), water (fluid), and steam (gaseous). Both analogy and experiment warrant the conclusion, that every particle of matter is subject to these modifications, although the power and knowledge of the chemist has no cognizance of the existence of many substances in all its three states. It is the ordinary state alone with which we are familiar, and which is, somewhat improperly, called its natural state; hence some substances are said to be solid, others fluid, and others gaseous, while in truth such state is merely the result of the accident of the moment.

In considering the action of substances one upon another, their changes of state have scarcely received that attention which the importance of the subject actually deserves. Although it is possible that under every modification, the *modus operandi* is the same, yet being viewed under different circumstances by the experimentalist, terms have been invented (or accidentally given) to express each; thus the action of concretes upon each other forms the sciences of electricity and magnetism; of concretes and fluids, galvanism; of fluids with fluids, chemical affinity; &c. The action of gases on each other when understood will furnish a new science, and present to us new powers far exceeding those of electricity, magnetism, or galvanism, a faint idea of these powers may be inferred from the action of fulminates, and of oxyhydrogen in the formation of water Whether man will be able to control and

use these tremendous powers, is a problem yet to be resolved, at present he has but extremely imperfect conceptions of their existence.

It is to me a matter of regret that philosophical language is so imperfect in the terms used to designate the actions I have alluded to, the discoveries that are daily making, require that some system be adopted expressive of the state of the substances under action, whether concrete with concrete, concrete with fluid, fluid with gaseous, &c.; in any adaptation of terms I would suggest that the terminations, *logy, graphy, ism, &c*, or any other, should be consistently applied. The nomenclature of chemical terms, though requiring modification, will give an idea of what I deem necessary by these observations.

It would likewise be desirable that some prefix or termination should be chosen to express the state of a body, or to speak chemically, indicative of the amount of caloric which it has in combination, and which would immediately express whether it is concrete, fluid, or gaseous. Although chemists tell us that water is a compound of oxygen and hydrogen some other binding agent enters into the composition differing from caloric, else highly rarefied steam and oxyhydrogen in simple mixture, would be the same.

Experimentalists have already observed that water and other substances have contrary electrical effects according to their state, thus dry ice is an electric, or non-conductor; while water is an electric, or conductor. Wood is a conductor; baked wood a non-conductor. Charcoal is a conductor, the ashes of burnt charcoal a non-conductor. These changes arise from the condition of the body at the time, whether as concrete, fluid, or gaseous, or from the combination of these states in other bodies with the substances operated upon.

If the chemist could perform his experiments in a perfect vacuum, many seeming anomalies would be explained, otherwise he has the most subtle and powerful agents (bodies in a gaseous state) entering into combinations and thwarting his expectations.

Yours respectfully,

A. PEACOCK.

February 20, 1841.

NEW THEORY OF THE UNIVERSE—FIRMAMENTAL AND ELECTRIC FLUIDS.

Sir,—I have had so few opportunities of witnessing experiments on electricity, that it is, I may say with fear, that I offer any observation on it to the public. Indeed, I could not do so if I were not encouraged by an opinion of Dr. Faraday's mentioned in a clever paper on the subject by H. Dirks, Esq., page 520 of your last volume.

In accordance with the "New Theory of the Universe," let the electric fluid be in ever so small or large a quantity, one part of it must be in a different state from the other, owing to the extreme *elasticity* of the fluid, since one part has the pressure of this firmamental fluid only, and the other of the firmamental and electric fluids. That part of the fluid which is most compressed would move slower, and have a greater tendency to fall.

Electricity I regard as the most powerful opponent of the firmamental fluid, (as may be exemplified by the electric dynamic cylinder with its suspended magnet,) with the exception of solar fluid and fire.

Your obliged servant,

E. A. M.

February 25, 1841.

NEW POSTAGE STAMPS—FORGING. AND COPYING.

Sir,—There seems to be a great unanimity of opinion respecting the superiority of the new postage envelope over the *ready mulled* original, now happily withdrawn. As far as *decent* taste is concerned, I can agree with the general feeling on this matter, but when it is considered that the object is not so much to "please the eye," as to *prevent imitation,* I do not hesitate to say, that the post office authorities are very, very far, from having produced a satisfactory token of P P.

When we consider the extraordinary development of skill in the arts of copying, which the last ten or twelve years has produced, even leaving out the modern and all powerful electro-type process, it will be seen, that the production of a really *inimitable* design is by no means an easy task. By the transfer process of lithography it is possible to re-

produce, with great facility, and with so much certainty, as almost to defy detection, copies of any printed subject; while the skilful operations of the caster, will produce, with nearly equal facility, accurate fac-similes of the most intricately-engraved dies. The more recent discoveries in galvano-plastics, however, have rendered the production of copper dies from any subject in relief, without any intermediate process, a more easy and more certain operation than even that of the lithographic artist.

The present postage stamps are of two kinds, the "adhesive," printed from a flat-engraved plate, and the "envelope;" printed from a die engraved in relief, which, while it gives the raised profile, &c. in white, stamps the table with a coloured ink.

From what has been already said, it will be seen, that both these stamps, by the two processes I have mentioned, can be copied *ad infinitum.* I fancy no lithographer's apprentice would admit of failure in the first—while the veriest tyro in the electro-magnetic process would hardly be satisfied until he had mastered the second.

The employment of first-rate talent was formerly considered to afford adequate protection against forgery, but this safeguard is thrown down by the progress of modern science. Forgery, indeed, as an imitative art, is now nearly, if not altogether extinct; instead of forging an *imitation*—modern rogues will reproduce *exact copies of the original!*

It may at first be supposed, that this serious state of things, is an evil without a remedy, but this is not altogether the case; for although, either printing or embossing singly, can be instantly and easily copied, a judicious combination of the two, throws a difficulty in the way not easily to be surmounted. Thus, if a very intricate design, such as a lace border, &c., were engraved and printed, and a design in relief was engraved upon an embossing die, and struck up upon the partially printed ground, the access of the lithographic copyist to the printed portion is cut off; because, in flatting the paper to effect the transfer, such a distortion of the parts would ensue, as to render the original unavailing for the purpose. So that, although the embossing might be copied, the effectual imitation of the original would entail the trouble and expense, with the attendant risk of detection, of an engraved imitative plate.

The trifling value of the postage stamps would never remunerate such a process, while the facilities at present afforded, do hold out a temptation to the dishonest skilful workman; and when we reflect upon the "hot haste" which must ever pervade all the ramifications of the post office executive, it is but too probable that a decently-executed counterfeit, might—as twice-used stamps have done—escape such vigilance as the circumstances admit of being used.

That a slight additional expense might be incurred at the Stamp Office, by this mode of working, is but of little importance; justice dictates, and humanity requires that every possible opening to fraud should be closed, and that the sound principle of preventing imitation by making the original inimitable, should be applied to meet all the exigencies which modern discoveries have given rise to.

It will be manifest, that although I have confined these remarks exclusively to the "postage stamps;" all other kinds are open to the same objections, and it will be worth while for "those whom it may concern," to think seriously upon this matter. Having called public attention to the circumstances, I leave each party to adopt such measures as their several cases may render expedient.

And remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, March 5, 1841.

WHITELAW AND STIRRAT'S WHEEL.

Sir,—I have watched with more than ordinary interest, in your valuable Magazine, each successive notice of Messrs. Whitelaw and Stirrat's water-wheel. It is an ingenious application of a principle as old as the knowledge of hydraulics. Merit is most justly due to Mr. Whitelaw for the successful application to useful purposes, of what was heretofore looked on as a mere mechanical toy. How many thousand facts and principles are at this moment known to the world, wanting only some active, persevering, and *monied* individual to establish their utility and to make the rest of mankind look in gaping astonish-

ment, and exclaim — "We knew that before." Aye, any fool could make the egg stand on its smaller end now.

If I recollect rightly, the first description I saw of Whitelaw's water wheel, the water was allowed to flow in at the top of a hollow shaft. The admission of the water below the revolving arms, is a great improvement. The weight of a hollow shaft, equalling in height the fall of the water, must be immense, especially when charged with water, and the friction on the toe spindle must be very destructive. Even if the upper end of a *short* hollow shaft revolved in a water-tight vessel, the pressure of the water added to its own weight must soon destroy the toe spindle and brass. As the water is admitted below the revolving arms, I think it would be an improvement if the top of the shaft were weighted with a globe of lead, so as that the shaft would counterbalance the upward pressure of the water, and thus destroy a large amount of friction. I do not approve of the principle of working the water-wheel in a condensed atmosphere, as noticed in your last Magazine (which I receive only monthly). The remedy is as bad as the disease. The condensed air which prevents the tail water from rising in the air vessel, diminishes the power of the machine, and every inch the tail water rises above the lips of the air vessel, by so much is the effective elevation of the head water lowered. Nay, the air, under a deeper air vessel, might be so condensed as to balance the downward pressure of the head water, preventing entirely the flow of water from the nozzles, and thus the machine would be stationary. Where tail water cannot be occasionally guarded against, I would suggest the lifting of the machine above the tail water, and which might easily be effected by a lever of the first order, to one end of which, the brass and stuffing box might be secured, and the other end depressed or raised with a screw. Thus the air vessel might be dispensed with, the machine being equally effective without it, and the attendant could at all times command a view of the machine. In a word, it would be easily *comeatable*.

One word more. Mr. Mainwaring erected a hydraulic engine near Whitby, on the principle of Watt's steam-engine. An air vessel near the cylinder prevents the percussion of the water at the closing of the valves. The level of the head of water above the cylinder is 170 feet. Now will some of your ingenious correspondents have the kindness to answer this question — If Watt's cylindrical steam engine, be more effective than Avary's rotary engine; why not Manwaring's cylindrical hydraulic engine, be more effective than Whitelaw's rotary hydraulic engine?

T. L.

Ardeath, County Meath, Feb. 19, 1841.

On the same.

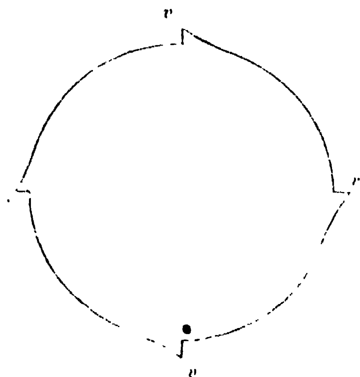
Sir,—When people begin to scold, I cannot help suspecting that they have some other object in view besides the attainment of truth, no matter whether the subject of dispute be politics, religion or philosophy.

Several of your late numbers have been occupied with angry discussions on Condensation of Steam and Screw Propellers, (for steam carriages on common roads seem to have come to a stand still of late:) very little to the edification of your readers in general. What do the public care who is the inventor of this or that?* What we want is a clear description of the invention, the principle on which it acts, and an account of experiments made with the new machine or instrument, with hints for its further improvement. I have read a great deal about the screw propellers, but never met with a clear exposition of the principle on which they act. Is it not nearly the same, whether a machine acts upon water, or water upon the machine? I read long ago of the screw being used instead of a water-wheel to work a mill, I presume it was not found to answer. I beg to ask, why?

We have now Whitelaw and Stirrat's patent improvement on the old Barker's Mill. I bought their pamphlet, hoping to find something of the *principle* explained, but I was disappointed; there is a great deal about the curvature of the arms, and other matters of detail in the construction, but not a word of the principle. This is, however, given in Ferguson's Lectures thus: "If there be no hole in the trunk, the pressure of the water would be equal against all parts of its sides within. But, when the water has free egress through the holes,

* The [illegible] ply say we. Ed. M. M.

its pressure there is entirely removed: and the pressure against *the parts of the sides, which are opposite to the holes*, turns the machine." Now from this it would appear that the pressure on the internal surface of the arms is in proportion to the height of the water; and the power exercised to turn the mill depends on the size of the orifice left open for the exit of the water, and the amount of pressure together. Would it not answer the purpose equally well to use a cylinder instead of bent arms, and to have vents for the water in the circumference, something in this way; where



v v v v, are the vents, as many as you please; and the water flies out in tangents? It seems to be on the same principle as Avery's Rotary Steam Engine, and more suited to small streams having great falls, than to large rivers with low falls.

With respect to steam carriages on common roads, I have long thought that they never can be made to work well, without very large wheels, say 10 or 20 feet in diameter, which would be frightful looking things going through the country; however, I think, they might be made sufficiently light, on the suspension principle, like the patent wrought iron wheels. I have been a reader of the *Mechanics' Magazine* from its commencement, and have seldom troubled it with my notions. Do what you please with these.

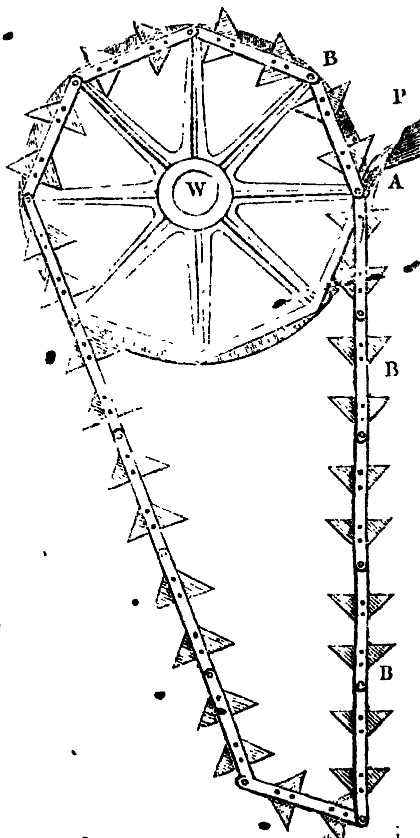
Your friend,

HENRY SHACKLETON.

Moone Mills, Ballito Feb. 20, 1841.

BUCKET WHEEL FOR MAKING THE MOST OF A FALL OF WATER.

Sir,—A few years ago I was induced to make a series of experiments upon the value of water as a moving power, which the recent account of Messrs. Whitelaw and Stirrat's new machine has brought to mind. I had a large model made of the best overshot water-wheel, and a bucket-wheel, of which the accompanying is a sketch. The length of the chain was exactly equal to the circumference of the overshot wheel, with the same number of buckets. After numerous experiments, I found, as others had done before, that the utmost I could get out of the overshot wheel was 70 per cent. of the power employed; while, with the bucket wheel, I realized 95.



The apparatus consisted of a wheel W, with an octagonal circumference, around

which a chain carrying the buckets B B, passed, each holding one pound of water. P represents the water pipe. The distance from A to D was equal to the fall of the water.

The result of my experiments showed that this was the best method of using water as a motive power, and not a very expensive one. The wheel may be 4 or 5 feet in diameter, and the axle as long as the quantity of water may require. The chain may be of strap iron 2 feet long, and of the strength required; they must be punched exactly alike, with a rod passing through the length of the bucket; or short ones would do passing through three places in the connecting straps. The buckets might be made of deal, with beech or elm ends, to be screwed fast to the iron straps. Perhaps sheet iron buckets bent to the shape, and riveted, would answer better.

A throttle valve for regulating the supply of water from the pipe P, might be acted on by a governor, like a steam engine, to ensure a uniform and steady motion.

I beg to be understood, as not laying claim to this plan as original, but merely bring it forward, as the best practical method under certain circumstances, of making the very most of a limited fall of water.

I am, Sir,

Your obedient servant,

J. Walker.

Crooked Lane, February 26, 1841.

SOLUTION OF THE 2nd MATHEMATICAL QUESTION.—BY MR. ROBERT HACKSHAW, GLOUCESTER-PLACE.

Sir,—In order to test the rule (which we have investigated below) we shall suppose the day to be May 10th, 1841. The sun's rising declination on that day at Greenwich is 17° 34′ 1″ N, and assuming the mean horizontal refraction to be 33′, by the ordinary process of calculation the apparent and mean time of sun rising at Greenwich on that day will be $1^h\ 22^m\ 14^s$ and $4^h\ 18^m\ 26^s$ A.M. respectively. Hence, the apparent time of sun rising at Greenwich on May 10th being $4^h\ 22^m\ 14^s$ A.M. It is required to determine by some short rule the apparent and mean time of sun rising at some other place, say Aberdeen.

Investigation of the Rule.

If refraction is left out of the question the apparent time of rising is expressed by the equation cos. P = tan. L tan. D, where P is the time (or polar) angle, L the latitude of the place, and D the rising declination. Now suppose L′ to be the latitude of another place, not differing much from the former in longitude, so that the rising and setting declination are nearly equal; then, cos. P′ = tan. L tan. D, hence cos. P : cos. P′ : : tan. L tan. D : tan. L′ tan. D : : tan. L : tan. L′. Hence, cos. $P' = \dfrac{\text{tan. } L' \text{ cos. } P}{\text{tan. } L}$ = cot. L tan. L′ cos. P, which is the rule we proposed to investigate.

Calculation.

The latitude of Greenwich is 51° 28′ 39″ N., and Aberdeen 57° 8′ 58″ N., whence,

L = 51° 28′ 39′ cot. 9.900955
L' = 57 8 58 tan. 0.189965
P = $4^h\ 22^m\ 14^s$ cos. 9.616755

P' = 3 57 19 cos. 9.707675

Hence, by the approximate rule, the apparent and mean time of sun rising at Aberdeen on May 10th, 1841, are $3^h\ 57^m\ 19^s$ and $3^h\ 53^m\ 31^s$ respectively.

We have calculated the apparent and mean time of sun's rising at Aberdeen for May 10th by the common method, and find them to be $3^h\ 57^m\ 40^s$ and $3^h\ 53^m\ 52^s$, hence, in this case the approximate rule gives the time of sun rising within 21 seconds of the truth, or it is true to the nearest minute.

As a second example, suppose the place is Dorpat, whose latitude is 58° 22′ 47″ N., and long. 26° 43′ 45″ E.

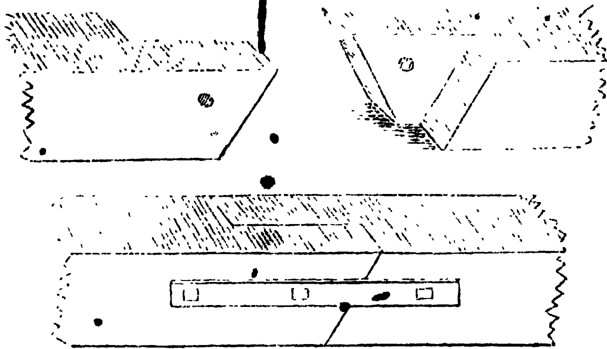
L = 51 28′ 39″ cot. 9.900955
L' = 58 22 47 tan. 0.210636
P = $4^h\ 22^m\ 14^s$ cos. 9.616755

P' = 3 50 33 cos. 9.728346

Hence, by the approximate rule the apparent and mean time of sun rising at Dorpat, on May 10th, 1841, are $3^h\ 50^m\ 38^s$ and $3^h\ 46^m\ 50^s$ A.M. respectively. We have calculated also by the common method the times for the above example, and find them to be $3^h\ 51^m\ 24^s$ and $3^h\ 47^m\ 36^s$, and here the approximate rule gives the required times within less than one minute of the truth, although the difference of longitude between the two places is 26° 43′ 45″.

R. H.

PLAN FOR SCARFING TIMBER.



Sir,—The above is a plan I have adopted for scarfing timber, which I believe has never been used by any one else; you will perceive it is upon the principle of the arch, and when a sound abutment can be obtained, it will only require a small bolt in the centre to couple the two pieces together. Should you think it worthy a place in your Magazine, you will oblige by inserting the same.

I am your obedient servant,
JOHN COMBES, Archt.
Imperial Saw Mills, City Road.

PERRY'S DOUBLE PATENT FILTER INKSTAND.

We took occasion in our 32nd volume (p. 338) to speak in commendatory terms of Messrs. Perry and Co.'s very beautiful and philosophical Patent Filter Inkstand. Twelve months subsequent experience has fully justified all the encomiums we then passed upon that contrivance, and it was with considerable delight we recently became acquainted with the still farther improvement which Messrs. Perry and Co. have introduced into this excellent instrument.

As originally constructed, the filtered ink was forced up into the dipping cup, by turning a screw which caused the descent of the piston of a small air pump; the improvement consists in fitting a neat cover to the dipping cup, which is attached to a cranked lever working the piston; so that the very act of raising the cover causes a flow of ink into the dipping cup, which the closing of the cover again returns into the body of the inkstand. Any thing more ingenious in idea, or more perfect in its practical operation, can hardly be imagined. By this novel and scientific arrangement, a supply of *clear fluid ink* is presented in the dipping cup, by merely lifting the lid; while shutting it down again withdraws it, in which state it can never overflow, whatever changes of temperature it may be exposed to, and is at the same time admirably protected from evaporation, dust, and all other injuries, in any climate.

As soon as the inkstand is filled, it is ready for use, and will continue to give a regular daily supply of clear ink for many months. For this improvement we are indebted to Mr. T. B. Daft (the original patentee) whose recently enrolled specification we noticed in our 913th number.

As the invention in its present highly improved form, is the subject of two patents, Messrs. Perry and Co. have given it the significant appellation of the *Double Patent Perryian Filter Inkstand.*

HOWARD AND SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—As a final reply to Mr. Howard, I have merely to observe, that I leave it to your readers to decide who has been the most uncourteous, or who the most candid, during this lengthened controversy—seeing that Mr. Howard has ventured to make assertions injurious to the reputation of my invention—upon the authority of a "leading Director," *sine nomine*, while I have either referred to "tangible documents," or given the names of parties disproving the misrepresentations of Mr. Howard and his nameless friend.

I really cannot help expressing my admiration of the high opinion Mr. Howard en-

tertains of himself. But does he really suppose that his mere *ipse dixit* will be taken by the public in a matter where the authority is questionable? I contend that, having made the opinion of the "leading Director" public, in justice he is called upon to bring that gentleman forward from the "privacy," in which he has been pleased to shelter himself, or confess, that in his haste they have misunderstood each other. I conclude this correspondence (resolved not to resume it, unless Mr. Howard acts with more candour,) with suggesting the propriety of considering whether it be the proper method of treating a scientific question, to attempt to bolster up any particular views with the preconceived opinions of nameless authorities.

Assuring Mr. Howard, that I have felt too much amused with his attacks to lose my temper, I would advise him, if he wishes in future to avoid scratches from "honest truth," to use less violent means than stone throwing, of intruding upon "his privacy."

I am, Sir, your most obedient servant,
WM. SYMINGTON.

Wangye House, March 3, 1841.

NEW FLEET OF STEAM FRIGATES.

The first of the steam frigates now being constructed under contract with her Majesty's Government for the Royal West India Mail Steam Packet Company, was launched from the building yard of Messrs. R. Duncan and Co. of this place, on Thursday last, at two o'clock. As the precursor of a more gigantic system of intercolonial steam navigation than has ever before been seen, the success of this vessel has been looked forward to with much more anxiety than any other launch that has taken place for a long time. Although her size is much greater than that of any other ship ever constructed in this part of the world, yet the correct judgment which has presided over her proportions, and the fine taste for which her builders are so justly famed, have left no appearance either of clumsiness or unwieldiness about her shape, which is as graceful and elegant as that of the smallest clipper on the river. At the appointed hour, she slid gently along the ways, and, descending slowly and gracefully, took her place on the waters. She was found to float precisely on even keel, and within half an inch of the anticipated draught of water; and stood up so stiffly, that although her masts were standing, and not a pound of ballast in the hold, she remained perfectly erect in the water, in opposition to all the efforts of a crowd of men on board, and to the force of a strong N.W. breeze striking directly on her broadside. She was appropriately named the *Clyde*, and gives every promise of sustaining the high character of the builders and engineers of that river whose name she bears.

The *Clyde* is the first of the fourteen frigates of equal dimensions now in progress of construction for the Royal Mail Steam Packet Company. They are all designed to perform, in time of peace, the service of mail packets to and among the West India Islands, and fully armed with the heaviest ordnance, to act as war frigates when required by Government for that purpose.

Thus the country will be doubly served; and while it pays to the Company £210,000 per annum for the transport of mails, it will defray, by the same payment, the annual charges of the largest and most powerful steam fleet in the world. These vessels are all of similar dimensions, having a capacity of about 1,500 tons each, with steam-engines of about 500 horse power. The aggregate fleet will thus consist of 21,000 tons, and 7,000 horses power.

The sound judgment which has guided the Directors of this Company in the outset of their undertaking appears, as far as they have yet gone, fully to justify the trust which Government has reposed in them, and to merit our confidence in their future discretion. So far as the construction of their fleet is concerned, they appear to have followed the soundest advice.

The subject of ocean steam navigation is as yet comparatively new. The *Great Western*, *British Queen*, *President*, *Liverpool*, and the Halifax packets, are our only examples of British ocean steamers; but of all these, it is matter of notoriety that the only successfully constructed ships are the *Great Western* and the Halifax steamers—the others serving as beacons to be avoided, rather than as examples to be followed. Now the soundness of the plans which the West India Directors have followed, may be judged by this, that their vessels are almost exactly of the proportions of the *Great Western*, and of the shape and construction of the Halifax ships, with this difference only, that they are larger than the *Great Western* or Halifax vessels, and have a greater proportional breadth of beam, to enable them to carry their armament of heavy guns on deck, while they have also a roomy spar deck for giving the air and accommodation so desirable in a warm climate.

Neither in their ships nor their engines do this Company appear to have been led into the experiment of any new and idle schemes or dangerous novelties. They have adopted the plain old lever engines, and ordinary boilers, as constructed by the most experienced engineers.

It is to be hoped that the same principles will continue to guide the Company in all their arrangements, and that system of intercolonial communication which, like the

Halifax system, was planned by our countryman, Mr. Macqueen, will be attended with beneficial results to the Company itself, and to the country at large.

In what we have said of the construction of the ships, we will be understood as speaking only of those few which we have seen; but we take it for granted that in all the great points of construction they are similar to each other. It is well known that different builders and different districts of the country have different modes of construction: thus the *Clyde*, which has just been launched by Mr. Duncan, may be supposed to resemble most the *Britannia*, Halifax ship, of which he was the builder: while the ships building by Mr. Paterson, at Bristol, may be supposed to resemble more the *Great Western*, of which he was the constructor; and the ships building on the Thames may be conceived to partake of the construction of the *Sesostris*, which was the *chef d'œuvre* of Mr. Pitcher. These varieties, while they will not interfere with the efficiency and uniformity of the fleet, will give the means of determining many important points in naval construction, and will enable comparative trials to be made with an accuracy never before attained. Thus, four of these ships, which are being constructed in our own harbours, under the direction of Mr. Scott Russell, of Messrs. Caird and Co., are all to have engines so perfectly identical with each other that every part of one engine will fit with accuracy any of the four pairs of engines; and as these are to be placed in ships built severally by Messrs. Duncan, Wood, and Thomson, any slight peculiarities in the forms of these four vessels will be most accurately tested; and as these four ships are formed upon the principles so much approved of on the Clyde, while the others are constructed more on the English plans, the value of the two systems will be conclusively ascertained.

Besides these four ships, there are two others being built on the Clyde, by Mr. Scott and Mr. MacMillan, with engines of Messrs. Scott, Sinclair, and Co.: one at Leith, by Mr. Menzies, and one at Cowes, by Mr. White, to receive engines from Mr. Bury, of Liverpool; four building by Mr. Pitcher, of North Fleet, on the Thames, are to have engines by Messrs. Maudsley and Messrs. Miller; and two building by Mr. Paterson, at Bristol, are to have engines by Messrs Acramans, of that port. Thus the merits of the most eminent steam ship constructors are placed in the closest competition, and, in their mutual rivalry, the Mail Company possesses a sure guarantee for the excellence of their fleet.

If we may be allowed to judge by the specimen we have seen in the Clyde the first of the fleet—such correctness of proportion, such beauty of mould, such sound material, and so substantial fastenings, have rarely, if ever, been combined to an equal degree, as in the frigates of the Royal Mail Steam Packet Company.—*Greenock Advertiser.*

SULPHURETTED HYDROGEN EVOLVED BY SALT WATER.

The Lords of the Admiralty lately transmitted to Professor Daniell, of King's College, eight bottles of water taken up in the rivers and on the coast of Africa, with a request that he would analyze them and report as to their effects on the copper sheathing of ships of which they were found to be especially destructive. With the immediate object of the inquiry we shall not concern ourselves, but some very curious and unexpected results came out incidentally, tending to show the probable cause of the miasma, which has such destructive influence on that coast—results especially interesting at this moment, when the Niger Expedition is just about to leave our shores—"The most remarkable circumstance," says Professor Daniell, "disclosed by the analysis of these waters, is the strong impregnation of the majority of them with sulphuretted hydrogen; which, in the case of the water from Lopez Bay, amounts to almost as much per gallon as in the Harrowgate waters. The proportions of the saline contents do not differ materially from those which are usually found in sea water. The extraordinary presence of this gas would naturally lead at first to a suspicion that it might arise from some change which had taken place in the waters after they had been bottled, from the decomposition of some animal or vegetable substance, but this suspicion is inconsistent with facts. On the other hand, it is difficult to conceive how such a striking and important fact as the impregnation of the waters of the ocean, upon such a long line of coast, with this deleterious gas, could so long have escaped observation. It is highly desirable in many points of view, that its existence should be substantiated, and the limits of the phenomenon both along the coast and in the ocean, ascertained by further evidence. Its effects upon the copper-sheathing of ships cannot fail to be highly injurious, and a question of still higher interest even arises, whether this deleterious gas may not contribute to the well-known unhealthiness of the coasts, from which these waters are taken. Upon searching for evidence of a similar phenomenon having been observed before, I have found in the Philosophical Transactions for 1819, a memoir of the late Dr. Marcet, "The specific gravity and temperature of sea-waters, in different parts of the ocean, and in particular seas, with some account of their saline contents." Out of sixteen spe-

cimens which he examined, he found one which was brought by Captain Hall from the Yellow Sea, in the Chinese Ocean, which from the account which he has given, must probably have been as highly charged with sulphuretted hydrogen, as those which I have just examined from the coast of Africa; and he observes, "there is something in the development of sulphur in sea-water, which is by no means well understood." He also noticed, that a specimen brought by Mr. Schmidtmeyer, going to South America, from latitude 10° 50′ north, longitude 24° 26′ west had an hepatic smell, and had blackened the bottle in which it was contained. If the existence of this curious phenomenon should be confirmed, the origin of the sulphuretted hydrogen will probably be found to be the same, as that of the same gas in various saline lakes in different parts of the world, from which trona or natron is derived. The mud of the Lonar Lake in India, of a lake near Maracaybo, in South America, and of similar lakes on the north of Africa, are all found to be thus impregnated. The sulphuretted hydrogen thus adhering to the clay, has been supposed to be derived from volcanic sources, but Mr. Malcolmson, in an able memoir lately printed in the Geological Transactions, says, that he has observed 'the same phenomenon in the salt water inlets, along the Indian coast, wherever the bottom contained argillaceous and carbonaceous matter:' and he ascribes the effect to 'the decomposition of the sulphates in the water by the carbon, and the clay only prevents its passing off into the air, or mixing with the water, by the power of adhesion. The subject is full of interest, both in a practical and scientific point of view, and well worthy of investigation." In a subsequent Report, on additional specimens, Professor Daniell observes:—"It is impossible not to speculate upon the origin of the deleterious gas, which has now been proved to impregnate the waters upon the Western Coast of Africa, in such enormous quantities, through an extent of more than sixteen degrees of latitude. It appears to me, that there are only two sources to which it can with any probability be referred, namely, submarine volcanic action, in which case its evolution might be considered direct or primary; and the reaction of vegetable matter upon the saline contents of the water, in which case it would be secondary. The probability of a volcanic origin is, I think, small, from the absence, I believe, of any other indications of volcanic action, and from the great extent of the coast along which it has been traced. What is known of the action of vegetable matter upon the sulphates, and the immense quantities of vegetable matter which must be brought by the rivers within the influence of the saline matter of the sea, renders on the contrary, the second origin extremely probable. Decaying vegetable matter abstracts the oxygen from sulphate of soda, and a sulphuret of sodium is formed. This again acting upon water decomposes it, and sulphuretted hydrogen is one of the products of the decomposition. You will perceive that there is a large proportion of the sulphates in the different specimens of water which have been analyzed, and there can be little doubt, I imagine, that extensive mud banks must be formed at the mouths of most of the rivers on the western coast of Africa, within the tropics, consisting chiefly of vegetable detritus in the exact state which is most favourable to the action which I have described. This view rests upon experimental evidence, and upon considerations of great cogency, derived from the unhealthiness of certain well-known situations in which decaying matters from tropical vegetation are brought into contact with sea-water. I feel more than ever convinced, that the evolution of sulphuretted hydrogen is intimately connected with the unhealthiness of such stations. When this matter was first brought under my consideration, I was surprised that the nauseous smell which must necessarily be evolved from water impregnated with this gas, at so high a temperature as that of the equinoxial regions, had not been noticed. I have in consequence turned to some of the accounts of the late travels in Africa, to seek for evidence upon the subject; and in the narrative of an expedition into the interior of Africa, by the river Niger, by Macgregor Laird, and R. A. B. Oldfield, I found the following important observations: 'The principal predisposing causes of the awful mortality, were, in my opinion, the sudden change from the open sea to a narrow and winding river, the want of the sea breeze, and the prevalence of the deadly miasma, to which we were nightly exposed from the surrounding swamps. *The horrid sickening stench* of this miasma must be experienced to be conceived: no description of it can convey to the mind the wretched sensation, that is felt before and after daybreak. In those accursed swamps, one is oppressed not only bodily but mentally, with an indescribable feeling of heaviness, languor, nausea, and digust, which require a considerable effort to shake off.' Now, these observations were made in the very locality from which some of the first waters which I examined were taken, and nothing more is wanting to identify the cause of the rapid decay of the ship's copper with that of the mortality of the climate. It has been experimentally found, that so small a mixture as a fifteen hundredth part of sulphuretted hydrogen in the atmosphere, acts as a direct poison upon small animals, and the sensations of languor and nausea, described by Mr. Laird, are exactly those which

have been experienced by persons who have been exposed to the deleterious influence small quantities. The peculiar unhealthiness of mangrove swamps in all parts of the world, I have little doubt, arises from that tree requiring salt water for its growth, and its decaying foliage being thus brought into immediate contact with the sulphates. The hypothesis also agrees with the fact, (which I believe has been established,) that the unhealthiness of such situations does not extend to any considerable distance from the sea."—*Athenæum.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JOSEPH LOCKETT, OF MANCHESTER, ENGRAVER, *for certain improvements in manufacturing, preparing, and engraving cylinders, rollers, or other surfaces, for printing or embossing calicoes or other fabrics.* Petty Bag Office, Feb. 27, 1841.

The patentee in this case, is one of the most extensive engravers for calico printers, and the improvements sought to be monopolized by his patent, consist in the application of the electro-magnetic precipitation of copper to the purposes of his trade.

In order to form a cylinder, a shaft, or mould is taken of the size required, which may be a conductor and form part of the finished cylinder, or it may be a non-conductor, and removed from the cylinder after it is completed. This shaft being immersed in a solution of copper is connected with the positive wire of a voltaic apparatus. A surface of metal, from which the cylinder is to be formed, is placed in the vessel touching the shaft, which metal is connected with the negative pole of the battery, by the action of which the cylinder is formed.

The patentee also explains a method by which he erases any desired portions of engraved plates or cylinders, by filling up the engravings on such parts with metal. Those portions of the plate or cylinder that are to remain unaltered, are protected by coating them with a suitable varnish. The parts to be erased are to be thoroughly cleansed with diluted nitric acid (one part nitric acid to twenty parts of water) and are then filled up by precipitating copper upon them by the electro-magnetic process.

After the cylinders have been formed in this manner, they are finished, by having a smooth and true surface given them by means of rotary files or cutters turned by suitable gearing.

The claim is to the application or use of the principle, force, or power of galvanic or voltaic electricity, for the purpose above described only; and also the rotary cutting or turning apparatus, subsequently employed upon rollers or cylinders so manufactured or prepared.

WILLIAM CHURCH, OF BIRMINGHAM, CIVIL ENGINEER, *for improvements in fastenings applicable to wearing apparel, and in apparatus for making the same; and also in the method of preparing the articles for sale.* Petty Bag Office, Feb. 27, 1841.

The fastenings applicable to wearing apparel herein referred to, are spring hooks and eyes. The improvement consists in contracting the beak of the hook, but leaving a sufficient opening in that part which is occupied by the spring tongue, so as to allow room for its playing freely. That part of the eye which is to be between the beak of the hook and its spring tongue is made straight and rounded while the other parts are flattened.

Another improvement consists in the substitution of a sort of staple formed of a piece of wire, for ordinary loops or eyes which is to be used in lieu of them in connection with the hooks.

The method of preparing these articles for sale relates to the preparation of cards to receive the hooks and eyes by piercing them for the purpose of forming loops within which they are held.

This is done by means of a pair of dies, which cut the card and at the same time raise the loop; a pair of hooks and eyes are slipped into each loop and there held, by which means the present method of carding by "sewing on" is wholly superseded.

BENJAMIN HICK, JUN., OF BOLTON-LE-MOORS, LANCASHIRE, ENGINEER, *for certain improvements in regulators or governors for regulating or adjusting the speed or rotary motion of steam engines, water wheels and other machinery.* Petty Bag Office, Feb. 27, 1841.

A bevel wheel is placed on the crank shaft of the steam engine to be governed, which drives a pinion on an upright shaft or spindle, revolving in suitable bearings in a frame. A thread is cut on the upper part of this spindle, on which a nut carrying a corresponding female screw works up and down, This nut has two projecting arms each carrying a vane, and is connected with the throttle valve of the steam pipe by links and a swivel, and connecting rods and levers in the usual way.

If the speed of the crank shaft exceeds the prescribed velocity, the resistance of the air upon the vanes causes the bush or nut to rise up the spindle and partially close the throttle valve. On the other hand, should the speed diminish, the nut will descend, and thereby open the throttle valve so as to admit an increased supply of steam to the engine. It will be seen that the novelty consists in the substitution of the rising and falling nut, for the expanding pendulums

hitherto used for this purpose—with what advantage we do not clearly perceive. The patentee does not confine himself to the precise arrangement given above, as the parts are to be varied to suit circumstances.

THOMAS HORNE, OF BIRMINGHAM, BRASS FOUNDER, *for improvements in the manufacture of hinges.* Rolls' Chapel Office, March 3, 1841.

These improvements apply particularly to the process of manufacturing hinges from plate iron, and consist, in the first place, in an improved manner of preparing the strips or plates of which the hinges are to be made, and also to their application to the making of hinges—that is, the "using up," or "working" of the same, or in other words, "cutting it up." And in the next place, improvements in preparing the knuckle or thinner parts of the said prepared strip or plate, so as to enable a better joint to be produced when the two halves or wings of the hinge are fitted together. And lastly, in an improved means of producing the countersunk holes to receive the heads of the screws by which the hinge is fixed in any required situation.

Reference is made to a former patent, "for certain improvements in the manufacture of hinges," dated July 24, 1835, in the specification of which, these improvements are stated to consist in making hinges out of sheet metal prepared of unequal thicknesses alternately, by means of rolling, drawing, stamping, or swaging, so that the parts which are used to form the knuckles or joints, are thinner than the parts which are to form the flaps or wings of the hinges; and of turning over the said thinner part into a rabbet, or against a shoulder, to form the knuckle. In the specification referred to, the groove, or thinner part of the metal, was described as being formed longitudinally as regards the direction of the grain or fibre of the metal: and that when such metal was cut up, so as to form the two parts of a hinge, the fibres would still be in the same direction. The first part of the present specification directs the fibres of the sheet metal to be placed in a direction across the hinge, or at right angles, or nearly so, with its length; and this is effected by forming the grooves or thin parts, which are to form the knuckles or joints at intervals across the piece of plate or strip of iron, which, being afterwards separated to form the two parts of the hinge, will have the fibres situated across each piece, whereby the patentee says, he is enabled to turn the metal round to form the knuckle with greater ease, and also to make a stronger knuckle than when the fibres are placed in the other direction. By the present arrangement, the direction of the fibres of the iron, is at right angles with the length of the hinge: that is, they will be placed around the pin of the hinge in a direction crosswise to its axis; whereas, in the former case they ran longitudinally, or nearly parallel to it.

The second part of the present improvements consists in pressing the thin, or knuckle part of the hinges, after they have been cut out, so as to compress and spread it, in order that the workman may be enabled, by filing, cutting, or otherwise removing the superfluous parts on the bulged sides of the knuckle, to form perfectly fitting joints.

The third improvement refers to a new method of making, or countersinking the screw holes: which may be performed after the holes have been punched in the metal or at the same time, by means of suitable dies and stamping apparatus. If the holes have been previously punched (cold) the metal is made red-hot, and struck between a pair of dies, one having a conical projection of the proper size, the other a hollow.

Another method consists in effecting the three operations of punching the holes, countersinking them, and spreading the knuckle part, all at one operation. For this purpose, a press and pair of dies are employed, the upper one of which has a step formed on its face so as to suit the figure of the metal, and also a cylindrical punch terminating in a conical shoulder. The lower die has a corresponding hollow for the punch to fit into. The metal, in a red-hot state, being placed on the lower die, the upper one is brought down by the action of the press or stamp, when the punch first cuts a hole through, and is followed by the conical shoulder which gives the required form to the hole, after which, the contact of the plain surface of the dies compress and spread, the knuckle part of the hinge. If necessary, the countersinking of the holes may be finished by using other punches, or by a rotary cutter.

The claim is—1, To the improved method of preparing the strip or plates of iron for hinges, so that the "fibres" of the metal shall be laid crosswise of the hinge.

2, To the expanding or spreading out of those parts which form the knuckles or joints of hinges, which has been previously cut, parted, or separated by means of any description of press and appropriate tools, in order that there may be sufficient width of metal to enable the workman to form a close, and neat, or perfect joint.

3, The operation of previously countersinking, or first preparing the screw holes by means of coned dies, as herein described, instead of altogether cutting out those parts which admit the heads of the screws by cutting tools or drills (or what in the trade is called "countersinks") as generally used for that purpose. The claim is also for the several operations either in combination or separately.

William Freeman, of Millbank-street, Stone Merchant, *for improvements in paving or covering roads and other ways or surfaces, being a communication.* Enrolment Office, March 6, 1841.

The improved paving which is here introduced to our notice, has at least the charm of novelty to recommend it; although emanating from one of the largest stone yards in the metropolis, it is neither Portland stone, granite, asphalte, nor wood! These materials have had it too much their own way, and must now give place to a rival of no ordinary *toughness* — henceforth, impervious and impenetrable pavements of *India rubber* are to minister to our comforts. We have heard that Prince Albert's new dog-kennel is to exhibit the first practical application of this important discovery: we would recommend its immediate adoption in the riding school, especially in the vicinity of the leaping bar, where it would serve the two-fold object of increasing by its elastic properties the spring of the animal in leaping, while in the event of any mishap, its tender reception of the rider would be incomparably grateful. In order to produce this inestimable pavement, India rubber is cut up into threads and placed within a cylinder having a series of teeth on its inner surface: a second cylinder similarly equipped on its external surface revolves within the first, by which means the India rubber becomes heated and reduced to a sort of pasty mass. In this state, it is saturated with charred sawdust, and then pressed in moulds; the bottom of the mould is covered with a layer of coarse sand, which becomes imbedded in the composition, on that which in use is to be the upper surface of the block. The blocks thus formed are to be hardened by continued exposure to the atmosphere. For street paving, the size rerecommended is 12 inches square and 3 inches thick, while for foot pavements a thickness of one inch will be sufficient: for covering walls, the blocks are to be the size and shape of the ordinary bricks. The blocks are to be united by means of India rubber cement. Ground stone, or sand may, it is stated, be used instead of the charred sawdust.

William Daubney Holmes, of Cannon-row, Westminster, Civil Engineer, *for certain improvements in naval architecture and apparatus connected therewith, affording increased security from foundering and shipwreck.* Enrolment Office, March 3, 1841.

The nature of these improvements are set forth as plainly in the following claims as it is possible to convey them, without the aid of drawings, by which the claims are almort entirely elucidated.

1. The application of iron stringers or ribs fixed obliquely to the ordinary angle iron ribs, and fastened to the same.

2. The application of diagonal iron framing or trusses in combination with the stringers and angle iron ribs of iron ships, boats, or other vessels; and also diagonal framing or trusses fixed to ribs and stringers within the ordinary angle iron ribs.

3. The application of diagonal braces and trusses to be fixed longitudinally or transversely through the ship or other vessel, or parts thereof, as described, and the connecting of the same to the bulk-heads or the sides of the vessel.

4. The construction of an iron beam by a combination of iron plates and iron trusses.

5. The construction of a beam by a combination of iron plates and wood, boards or planks; not less than three of one and two of the other being laid together alternately.

6. The construction of an iron beam, by several iron plates being laid and fastened together.

7. The application of corrugated plates or bars of iron to give stiffness to the stringers, beams, braces, trusses, or ribs of iron ships and other vessels.

8. The division of the ship or other vessel into cabins or state rooms by iron plates, or iron frame work in connection with wood, papier maché, or other suitable material, which may be used for panels.

9. The applicetion of layers of plates of iron and other materials, one over the other, to ships of war and other vessels for the resistance of shot.

10. The construction of an arched trussed iron beam for the support of the planking of the deck.

11. An apparatus to represent the undulation or section of the ground over which the ship or other vessel floats.

12. The application of the chronometer, or compass suspension, for the suspension of berths or cabins.

13. The steering of boats or other vessels by means of reins.

14. The application of an air-tight pipe, made of India rubber or other suitable material, for closing hatchways or other openings in the decks or other parts of ships, boats, and other vessels.

Thomas Motley, of Bath Villa, Bristol, Civil Engineer, *for improvements in apparatus, and means of burning concrete fatty matter.*—Enrolment Office, March 6, 1841.

This apparatus belongs to the numerous, but unfortunate, class of contrivances, in which a portion of the heat produced by light-making combustion, is employed to liquefy the tallow, or other concrete fatty matter, whether simple or compound.

The present contrivance rejoices in the title of the "Albion lamp," two modifications of which are shown. The first, which is designated the "Single chambered," consists of a large flat cistern, or reservoir, from which two arms project, furnished with

small cavities for holding a flat or cylindrical wick, and having air shafts around them. Small metal plates, which project over the air shaft from the chamber, touch the flame and thereby receive a certain portion of heat, which they communicate to the chamber and its fatty contents. This portion of the lamp may be mounted on any approved kind of stand or pedestals, and is furnished with small cups under each burner to catch any grease that may pass over. In order to light the lamp, in the first instance, a cake of tallow, &c., moulded to the proper size, is laid in the reservoir or chamber, and the lamp made hot before a fire to melt it; or a candle is held under the wick-holder and air-passages until that part is too hot to be touched with the finger; or, till the tallow is sufficiently melted. The wick is then lighted, and by its own heat effects its further supply of melted tallow.

The second, or "Fountain chambered," has an elevated cylindrical reservoir or fountain, placed above the cistern, which in the former instance does not rise above the level of the burners. This reservoir is closed at top by an air-tight screwed cap, which has to be removed when a cylindrical block of tallow is supplied to the lamp. There are three, or any required number of, burners to this lamp, and, in order to set it going at first, an auxiliary light (a piece of candle) is introduced into the hollow stem or pedestal, which heats the chamber and melts the tallow; when this is accomplished, the auxiliary light is extinguished, and the process of liquefaction is performed by the apparatus for that purpose made and provided. These lamps will burn either with or without the air-shafts and glasses, but they are much better with these appendages.

The claim is, 1. For applying an auxiliary light under the chamber, for the purpose of rendering the concrete substance liquid, for the object of first lighting the lamp; as soon as that is accomplished the auxiliary light is extinguished.

2. Applying two, three or more wick-holders to the outer edge of the chamber, with circular, semicircular or oval air-shafts in the inside towards the chamber, as shown in the drawings.

3. The plan of attaching a small plate over the said shaft, which I term a liquefier, or heat communicator.

JOHN WHITEHOUSE, THE YOUNGER, OF BIRCHALL-STREET, BIRMINGHAM, BRASS-FOUNDER, *for improvements in the construction of spring hinges and door springs.*—Enrolment Office, March 6, 1841.

In door springs, as heretofore constructed, the action of the spring has been horizontal, *i. e*, in the direction of the door's motion; the object of the present improvement is to employ spiral or other springs acting vertically, or at right angles, to the motion required, which, by operating on suitable inclined planes produce the desired closing of the door.

The spring hinge, is formed of a central spring barrel placed between the two flaps of the hinge, closed by end caps. A vertical spindle terminating in a conical end, works in the lower cap, while its upper end rises through that at the top of the barrel and terminates in a square shoulder. Near the lower end of the spindle a stem projects horizontally, and carries a small friction roller; above this roller there is a horizontal circular disc with a hollow stem, which slides up and down upon the spindle, but is kept down, and in contact with the friction roller by a spiral spring, which surrounds the spindle and abuts against the upper end of the barrel.

The under side of this circular disc is formed into an inclined plane, so that when the spindle is made to turn upon its centre, the friction roller traverses the inclined surface, and causes the elevation of the disc and consequently the compression of the spring. Although at liberty to work freely in a vertical direction. the inclined plane is prevented from turning round by a projecting feather working in a groove in the spring barrel. The two flaps of the hinge are joined together lengthways in the middle by screws. One flap is attached to the spindle by its square shoulder, while the other is made fast to the barrel; so that when fixed to a door, and the door is opened, the turning of the spindle raises the inclined plane and compresses the spring, the re-action of which returns the door, when let go, to its original position.

A door spring is made upon the same principle, but as in this case there is no flap, the spring barrel is sunk and secured into the floor, while a metal arm or lever affixed to the door takes hold of the square shoulder on the top of the spindle, and thereby communicates the energy of the spring to close the door, in the manner already described.

In another modification of door springs, intended for large and heavy doors, the spring, and riser carrying a friction roller, are placed in front of the spindle; in this case, the cylindrical plate or disc is fixed upon the spindle itself, and has the inclined plane on its upper surface. The riser works vertically in two guides or grooves in the spring barrel, being urged downward by two spiral springs coiled one within the other. If the spindle with its inclined plane is turned, the roller, &c., is forced upward, and the re-action of the spring, as before, urging the spindle back again, closes the door. In another arrangement, a common flat bow-spring is employed in lieu of the spiral, the arrangement being otherwise the same as last described. In both cases, a notch or step with sloping edges is cut in the inclined plane for the friction roller to fall into and ensure the close shutting of the door.

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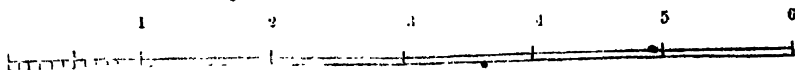
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 919.] SATURDAY, MARCH 20, 1841. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

CRAIG'S PATENT ROTARY STEAM-ENGINE.



CRAIG'S PATENT ROTARY STEAM-ENGINE.

[In a recent number (908) a correspendent furnished us with a short account of a new rotary steam engine on Avery's principle, which had just been put up in the neighbourhood of Newcastle. We have seen a similar engine that has for some short time past been employed at the establishment of Mr. Smith, metal grinder and steel polisher, in York-street, Castle-street, Saffron-hill, and we have now the pleasure of laying before our readers a full description of it, from a very clever pamphlet which has just appeared from the pen of Mr. W. Edwards Staite.*

Although we are by no means prepared to assent to the correctness of the comparison which Mr. Staite has instituted, between the disadvantages of the piston-engine and the advantages of the emissive rotary-engine: yet we must admit, he has *prima facie* made out a tolerably strong case in behalf of this form of rotary engine. Smeaton and Pelectan made a number of careful experiments on engines of simple emission, and they found by their investigations, that 3 parts out of 11—8 parts out of 27—and 2 parts out of 5, were the highest measures of useful effect they could possibly obtain; they also inferred, that by no possible improvement could more than one-half of the power be turned to a useful effect. Enough, however, seems to have been already done to show that this limit has been passed, and that for certain purposes, and in particular situations, the emissive rotary engine, in the highly improved state in which it has been produced by Mr. Staite, may be employed with very considerable advantage.

The cheapness of its production—fewness and simplicity of its working parts—freedom from vibration—non-liability to derangement—and compactness, are all great advantages, and possessed in a very high degree by Craig's* Rotary Engine. We shall be glad to receive an account of the work actually done, and the fuel consumed in some of these engines, so as to form a correct estimate of their value on the score of economy in working. We were informed that the engine at Mr. Smith's, when working up to about 13 or 14 horses power (making 2,700 revolutions per minute) consumed about 7½ cwt. coals per day.]—Ed. M. M.

"Craig's Patent Rotary Engine, (of which a front elevation is represented by the engraving on our front page,) consists of *a flat feather-edged arm* revolving vertically, and which is worked in the following manner:—

The arm is bored hollow nearly to its extremities, having a small aperture, or nozzle, at each end, *at its opposite edges.* The axis on which it is fixed, and with which it revolves, is also hollow on one side to the centre. Through this hollow axis, the steam is admitted direct from the boiler, it passes into the arm, and and, having no other means of escape, issues from the apertures or nozzles at the end of the arm into the case within which the arm works, causing the arm with the axis, by the pressure of the steam, *to rotate in an opposite direction.* The steam, after it issues from the nozzles, is collected in the case, from which it blows off gradually, by means of an ejection-pipe, into the chimney or elsewhere.† Connected with the axis with which the arm revolves, is a small pulley or drum; over this pulley (in all the smaller power engines), is passed a belt or band communicating with a larger

* Craig's Patent Rotary Steam-Engine, explained and illustrated; with a concise review of the invention of the Piston Engine, and a comparative estimate of their relative power and advantages, by W. Edwards Staite: London, Houlston and Stoneman, p.p. 36.

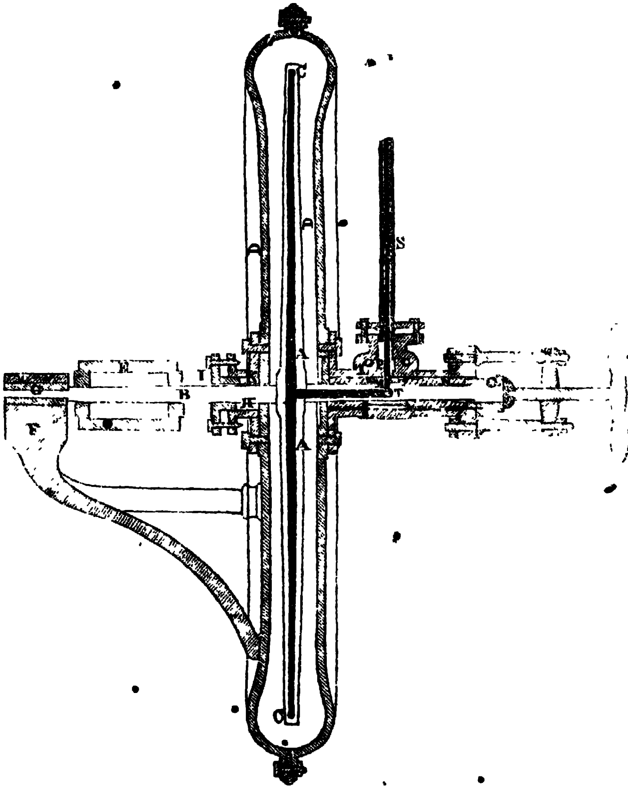
* Patent sealed, Nov. 25, 1831.

† The waste steam may be advantageously used for warming factories or buildings, or for drying chalk or any other substance, (provided its free discharge from the case is secured;) or the steam may be condensed, and the water used over again in the boilers, if desirable; or the heat may be extracted from the waste steam, (after it is discharged from the case,) by a fan-wheel, and conveyed as a hot blast into the furnace. This is a great aid to the engine, by withdrawing the steam and saving the fuel.

drum above, the diameter of which is increased so as to reduce the speed according to the degree required for any particular work, and which will be in the ratio of their diameters. The great velocity and force of rotation of the pulley communicates a very swift and powerful motion to the drum, with which it is connected; from this drum the power is taken off and applied, and the "useful effect" of the engine at once commences.

It has no cylinder, beam, crank, fly-wheel, parallel-motion apparatus, condenser, air-pump, or other intricate mechanism, liable to derangement or accident. It has but *one moving part*, and that *so simple in construction*, as to ensure almost perfect freedom from wear and tear. The axis alone produces any

Fig. 2.



friction, and that so trifling as scarcely to be computable. The axis works in a stuffing-box of hemp, which is lubricated by the steam, no oil being required for the purpose.

It will be apparent at first sight that the *principle* upon which the engine acts, is the same as that upon which Hero constructed (120 years B. C.) his engine. But as before observed, the general principles of physical science are so little understood in practice, that, in this instance, the principle upon which the steam acts in the engine in question, has been the subject of warm discussion by scientific men, who have entertained directly opposite opinions respecting it,—some maintaining that the power is obtained solely by the resistance of the steam against the surround medium or by *reaction*, and others stating the reverse. If the former be admitted, it is quite clear that *in vacuo* the arms would have no power whatever, as the steam

would have nothing against which to strike, and no reaction would consequently take place.

That it is *not* reaction, is clear from the fact, that the arms work with greater power in vacuo, than when acting against the resistance of the atmosphere. It will be found that owing to the rapid rotatory motion of the steam, after its escape from the nozzles within the case, it has a tendancy to fly by centrifugal force from the centre to the circumference of the case—the more dense vapour of course collecting farthest from the centre. It there forms itself into a ring, surrounding the case, and out of reach of the arm by some inches, which travels free from its resistance; the waste steam then escapes—so that, in fact, the arm really works more or less in vacuo, in every instance, *and that without any condensation*, the medium through which it passes being so highly rarefied and attenuated, as to impede its free action to a very trifling extent only. The true principle may be explained by a reference to a well known law in physical science.

When a fluid issues from any vessel in which it is confined, that vessel suffers a force equal to that with which the fluid escapes from it, *and in the opposite direction*. If water issue from an orifice, a pressure is produced behind the orifice corresponding to the force with which the water escapes. *Barker's* mill is with water, what this engine is with steam, so far as the general principle upon which it acts is concerned, but no further. If there were no apertures or nozzles in the arms, its equilibrium would not be destroyed by any pressure within, and it would remain in a state of rest. Make an opening on one side, and the pressure, which before was equal throughout, *is taken off* on that side, and the equilibrium destroyed, and force is of course communicated in *the opposite direction* to that of the aperture or opening so made.

The principle, then, upon which motion and power are communicated to the arm, is not by *reaction* against any resisting medium, but by *the taking off of pressure on one side of the arm, by which its equilibrium is destroyed to that extent, and by which a pressure is communicated to it in the opposite direction, equivalent to the pressure so taken off, whatever that may be.*

A curious discovery has recently been made by the writer of this paper, in relation to the agency of electricity, which is not unlikely to lead to important results in practical science. The high-pressure steam used by the engine, is found to be highly charged with *electric fluid*. As the steam escapes through the nozzles it throws off brilliant coruscations of electric light, illuminating any substance placed within its influence. The discovery in question was the result of experiments, made with a view to ascertain what *agent*, besides steam, contributed to the power *which was actually obtained from the engine*, and which was found to be greater than the steam used was capable by computation of giving out. It was thought to be probable, that the rapid action of the steam after it left the boiler, might (from its highly elastic nature) in its passage through the arm and axis, produce by friction the electric fluid, in a greater or lesser quantity; and which might have some peculiar effect upon the steam, whereby its pressure would be increased. The first experiment satisfactorily proved the presence of electricity to an extent far greater than was anticipated. Indeed, the steam seemed to be so highly charged with it, that in the dark the entire volume of vapour) (itself a bad conductor of light) was luminous, emitting sparks and streams of brilliant electricity, which seemed to increase in intensity as the experiment was protracted.*

That the electric fluid, acting in combination with the steam, has the effect of expanding it and increasing its power, there seems to be little doubt; but to what *extent* its agency may affect the general question of power, *under the circumstances*, or how far that power may be still increased, must remain for the present uncertain. Further experiments will probably throw additional light upon this interesting subject; which is merely alluded to here, as affording *a clue* to the elucidation of the power of the engine, and which, as before observed, cannot be accounted for upon the hypothesis that steam alone is the agent employed.†

* Professor Jeffrey, of Glasgow, conceived the power to be aided by a "gas" stronger than steam, but the idea of electricity was not thought of.

† Since these experiments were made, the writer of this paper has been informed that a similar discovery of electricity in combination with steam,

The pressure at the end of the arms depends upon the pressure of the steam in the boiler, and the velocity of the arms is partly owing to the same cause; for the greater the pressure of steam in the boiler, the greater will be the velocity at which the steam will issue from the orifices at the ends of the arm; and, as above shown, the greater, or rather more rapid, will be the action of the steam on the side of the arm opposite the orifice. From this, it appears that the velocity with which the steam issues is entirely independent of the length of the arm, and is produced alone by the pressure in the boiler; and the *speed* at the end of the arm will therefore be the same, at any given pressure of steam in the boiler, whatever the *length* may be, or very nearly so; and the length of the arm will only vary the number of revolutions made per minute.

It has been ascertained (by a series of careful experiments) that the best speed of the arm to secure the greatest amount of "useful effect," or working power, is 45,000 feet a minute: that is, that the periphery of the arm (whatever its length may be) should pass through a space of 45,000 feet a minute.

In conclusion, it may be remarked that all new inventions have to combat the difficulties with which prejudice for existing and long-established principles invests them. The interests of those engaged in the manufacture of engines upon the old principle, are necessarily opposed to the advancement of a machine so simple as the rotary engine. It could scarcely have been expected to be otherwise. The opposition it has met with from such sources since its first introduction to public notice has retarded its success to a great extent—a host of objections have been raised against it, for the most part of a frivolous character—many statements grossly erroneous have been circulated to its prejudice; and, notwithstanding they have been met by *facts* (in themselves unanswerable), they have not been found sufficient to prevent the reiteration of the same fallacies again and again. We know that truth will in all cases ultimately prevail over error; and that, in the face of the fiercest opposition, an invention of merit will work its way in public estimation sooner or later.

This has been the case with Craig's Rotatory Engine. After years of anxious labour, and a vast expenditure of money, success has dawned upon it. Several engines have recently been erected in Great Britain, and others sent to the colonies, and in no single instance has any result other than the most satisfactory followed their adoption. Testimonials from unprejudiced persons, speaking in the highest terms of the invention, have been received, forming a mass of evidence of the most valuable kind. The opinions of many eminent scientific men have recently been expressed in favour of the invention—opinions founded, for the most part, upon *observation and experiment*, rather than on *theory;* and the invention is now brought prominently into notice, under the conviction that, its merits having been completely established, not only by *rigid experiment*, but by *actual work performed* in numerous factories and other places, it will be found worthy of universal adoption."

Description of the Engravings.

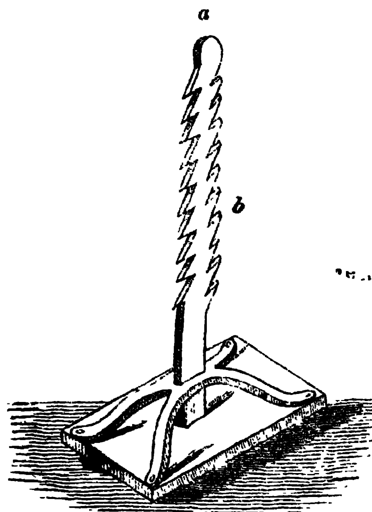
The engraving on our front page, represents a front elevation of an engine of 20 horses power. A, is the case within which the arms revolve; B, the frame which supports the case; C, a screw to tighten the packing; I the steam-pipe; J, the ejection-pipe; K, the belt conveying the motion from the pulley to a drum; L, is the arm-hole door;

Fig. 2, is a transverse section of the engine, showing the internal parts.

A, the arms; B, the axle; C, the nosel, or lateral orifice through which the steam escapes in opposite directions, giving rotary motion to the arms; D, is the engine case; E, driving pulley; F, a basket for supporting the extreme end of the axle; G, the journal; H, a short stuffing-box; I, gland for ditto; K, hemp packing; L, long stuffing-box; M, skeleton gland; N, hemp packing; O, gland behind packing; P, slide-valve seat; S, steam-pipe; T, orifice in axle for admission of the steam through the arms to the nosels.

has been made at Newcastle, and quite by accident. The writer, however, claims the priority of the discovery in point of time, having made h[illegible] ment some weeks earlier.

IMPROVED RAILWAY CARRIAGE LIFTER.



Sir,—In your Magazine for October 3, page 356, I notice with no small pleasure a drawing and description by Mr. Baddely, of an *improved carriage lifter*. Permit me to suggest a further improvement therein, which will do away with the pin, the braces, and the chain. The upright shaft *a*, should have a series of ratchets upon *both sides*, each set having a contrary direction; the lever might then rest upon those pointing upwards, *b*, instead of upon the bungling pin, the rest may remain exactly as in the original drawing, with a trifling alteration of the lower part of the lever, which must be made so as to bite well in the upward pointing ratchet *b*.

Your obedient servant,

TRAWETSIN.

Lynn Regis, Norfolk, Feb. 19, 1841.

LIFE ANNUITIES.

Sir,—The method of finding the present value of £1 annuity depending upon any given age, and for any given period of time, is found from the theorem—

$$P = \frac{1}{a}\left(\frac{b}{1+r} + \frac{c}{(1+r)^2} + \frac{d}{(1+r)^3} + \&c.\right)$$

The arithmetical calculation for this is very laborious; could any of your mathematical contributors give a short and more approximate rule for finding the value of P, for periods of 5, 7 and 10 years? If they can do so they will much oblige a constant reader of your highly useful journal from its first number.

W. P.

EXPERIMENTS AT THE POLYTECHNIC INSTITUTION ON MARINE PROPELLERS.

Among the mechanical models now exhibiting at this Institution, is one of the *Archimedes* steamer, with the screw of Mr. Smith in its most improved form; another of a boat with Mr. Stephens's well known paddle-wheel, and a third of a man of war with Capt. Carpenter's new quarter propellers—so called from their being placed under the hind quarters of the vessel. The following comparative experiments with these models were made last week.

First, the vessels of Mr. Stephens and Capt. Carpenter were lashed stern to stern and started together at the same instant. The paddle-wheel propelled vessel, unlike the experiment described in the *Mechanics' Magazine* between the *Archimedes* and the *William Gunston* tug, on the river Thames, soon yielded to the superior power of the new propeller, and was dragged up to the other end of the sheet of water.

Second, a trial of speed then followed: the result of which was that Capt. Carpenter's model went along nearly twice as fast as Mr. Stephens's with the paddle-wheel.

The two vessels it is proper to state were well matched in size and in other respects.

Third, the *Archimedes* then challenged Capt. Carpenter. The two vessels were placed a-breast of each other, and at a given signal they started together. The result of the experiment was that Capt. Carpenter's model beat the *Archimedes* in speed, and with a very inferior motive power.

On another occasion, Capt. Carpenter's propeller was fixed upon the same shaft to which Mr. Rennie's conoidal propeller had been applied, with the same boat, the same machinery, the same power, and in the same position. Mr. Rennie's propeller, after a few trials, was found not to be so strong as it ought

to have been, and consequently the experiment went for nothing, except in this way:—In Mr. Rennie's circular of the 8th August, 1839, we find the following comparative statement of the capabilities of Mr. Rennie's propeller and the propeller used on board of the *Archimedes*:—

	Distance in chains.	Time in seconds.	Revolution of propeller per minute.	Speed of boat in miles per hour.
Mr. Rennie's Propeller......	10	130.3	202.8	3.4
The Screw Propeller........	10	171.5	218.6	2.6

From the above table it appears that Mr. Rennie's propeller will, with an equal exertion of power, and working within equal limits, produce a speed $\frac{1}{23}$ greater than is obtained with the screw, while it is driven at a velocity $\frac{1}{16}$ less than the screw.

Now Capt. Carpenter makes use of the same machinery, and applies the same or an equal power to his propeller, in a boat having nearly the same area of midship section, and instead of obtaining a speed only of 3.4 or 2.6 miles per hour, he propels the boat 88 yards in 30 seconds, making 120 revolutions with the propeller, which is a speed of 6 miles per hour where the screw and Mr. Rennie's propeller only make half that speed.

It may be asked, how is this great difference of speed to be accounted for, if it be not the shape of the propellers employed by Captain Carpenter? Captain Carpenter uses as his model for a propeller the same figure as Sir Isaac Newton describes as offering the least resistance to the fluid in its longest axis, and the greatest resistance in its broadside, and this is what is required of such a propeller. It is, moreover, the same figure as the late Colonel Beaufoy made so many satisfactory experiments with, in determining the resistance of fluids. In a circular issued by Captain Carpenter, he compares the position of his propellers to that of the aquatic tribes of birds of the Auk species, and the action of his propellers in the water comes very near to that of the fish's tail, which everybody must allow is the best model after all.—*(From a correspondent.)*

THE SUPERIORITY OF CORNISH SINGLE LIFTING ENGINES OVER ROTATIVE.

Sir,—The object of the present paper is not so much to account for the great duty performed by the Cornish engines (though on this point I may touch hereafter), as an attempt to discover the real causes of their superiority over rotative engines. This is a subject of far more importance, (to my mind there is no question connected with steam navigation of equal moment). The former is a fact well established, though not well accounted for, the beneficial effects of which are already felt. Before we can expect the same results in other engines, we must be satisfied that the true causes of difference are clearly discovered, and, where there are several, that the accurate proportion is assigned to each. Whilst looking into this question, the many contradictions I found in those *facts* which seem to me to bear upon it, naturally reminded me of the old philosophy of Pyrrho. This ingenious gentleman finding all matters of human enquiry, as inextricably involved in uncertainty two thousand years ago as they seem to be now, thought it the wisest course never to make up his mind on any one thing; and thus he passed a long life in running after truth until death stopped him in the race. The plan was original and safe, for being never wrong he preserved his reputation to the last, and like other wise men who never risk an opinion, gathered much glory in reversion. The curse of investigation into the past, seems always to have been the inaccuracy of instruments, the incorrect observance of facts, or the record of one-sided facts. This is the complaint of most philosophical enquirers; and if I thus occupy your columns by these prefatory remarks to direct attention to such fatal and often ruinous errors of practice, "it is not," as Lord Bacon observes, "by way of ostentation, but because it may be useful." "Men," it is justly observed by Professor Playfair, in his excellent analysis of the *Novum Organon*, "men, in their inductive reasonings, deceive them-

selves continually, and think that they are reasoning from facts and experience, when, in reality, they are only reasoning from a mixture of truth and falsehood. The only end answered by facts so incorrectly apprehended is that of making error more incorrigible. Nothing indeed is so hostile to the interests of truth as facts incorrectly observed."*

I am more particularly led to make these observations, by observing the great inferiority in the indicator diagrams of those engines under Mr. Watt's own superintendence, to those of the present day. By and by will be seen the importance of first ascertaining to which the superiority of performance is really due; because three things are inferred therefrom, bearing upon the subject of theis paper: — 1st. That the rotative engines of the present day (from causes independent of more complete clothing or the use of expansive steam) *always* perform better than the *occasional* best performances of Mr. Watt's rotative engines when under his own care (which I very much doubt). I have not seen this yet touched upon, and it is desirable to settle the point. 2ndly. If I am right, the indicators are now incorrectly made; or, 3rdly. They are not properly adjusted or applied.

The indicator not being generally known, it is desirable it should be first understood, and the following observations upon it will, I hope, be sufficiently explanatory.

On the Indicator.

No instrument perhaps connected with the steam-engine is more beautiful in itself, more admirably adapted for the purpose for which it was intended, or, if well made and accurately adjusted each time of trial, more exact in its results than this simple little recorder of the internal operations of the engine. The purpose for which Mr. Watt invented the indicator was to ascertain with certainty the mean steam pressure, and, more particularly, the proportion the exhaustion or vacuum of the cylinder bore, at different parts of the stroke, to the vacuum in the condenser, in order to know what area and length of piston to allow for different powers: also that the gross power of the engine might be calculated with accuracy, and the proper proportions of the steam and eduction valves be determined. This was of the last importance at a time when the best relative size of the parts had to be ascertained, and neither the tools were invented, nor the hands found capable of using them. Thus Mr. Watt had not merely, day by day, to invent instruments, to instruct the workmen to ply them, but to meet by his wonderful and ready resources, the numerous exigencies of the moment, inseparable from a large and *novel* manufactory of most accurate parts.

The principle of the indicator is that of the atmospheric engine, the spring being added to mark the degrees of pressure. A miniature Newcomen's engine of two inches diameter fixed on the cylinder will enable any one to comprehend its action. The steam piston and the piston of the indicator will therefore act in opposite directions, for the steam entering between the two, separates them, pressing the steam piston down, the other up against the atmosphere. This marks the steam pressure. When the steam piston begins to reverse its action the exhaustion in the cylinder commences, slowly at first, more complete as the piston finishes its stroke. The indicator partakes of this exhaustion in exact proportion, and its piston is consequently pressed down by the atmosphere, as in Newcomen's engine. This marks the vacuum of the cylinder throughout the stroke. The indicator piston moving rapidly up and down so short a space would leave a difficulty in ascertaining either the mean steam pressure, or mean exhaustion of the cylinder. Mr. Southern, an ingenious assistant in Boulton and Watt's service, added the paper and pencil to trace a diagram, by which the variations at every part of the stroke might afterwards be ascertained. Though in the indicators of the present day this paper is placed round a cylinder made to revolve by a string attached to the top of the piston, and is more compact, I give a sketch to preserve the one used by Mr. Watt, and because it can be easier understood.

* Is it not kindness to Mr. Urwin to tell him that this observation is applicable to his invention, that he may at once consult some talented engineer before he spends a fortune in pushing what (I think) no one will adopt, who are acquainted with Woolfe's expansion engine? By the means stated it is impossible to obtain the results said to have been obtained.

Fig. 1.

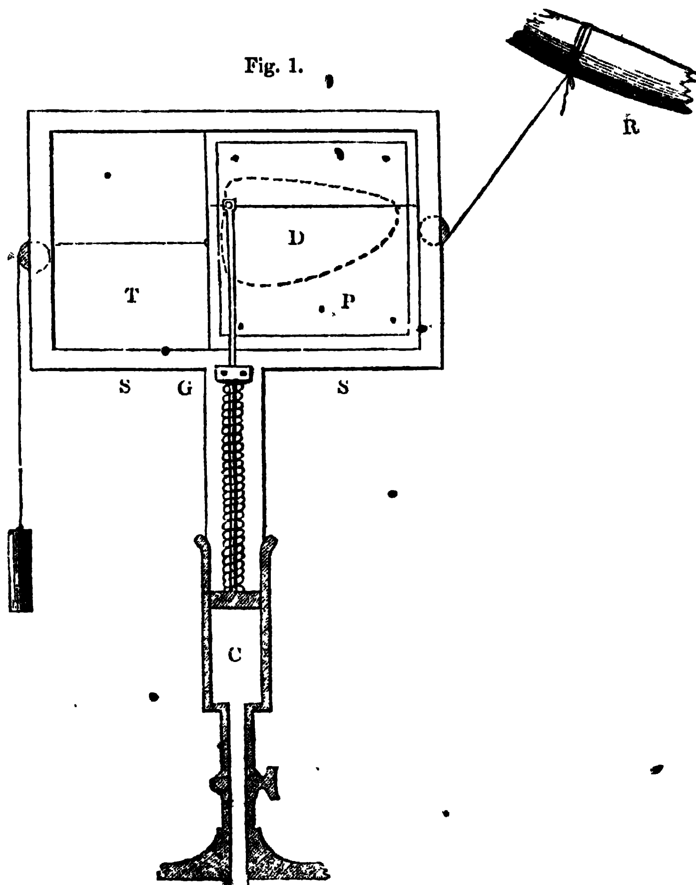
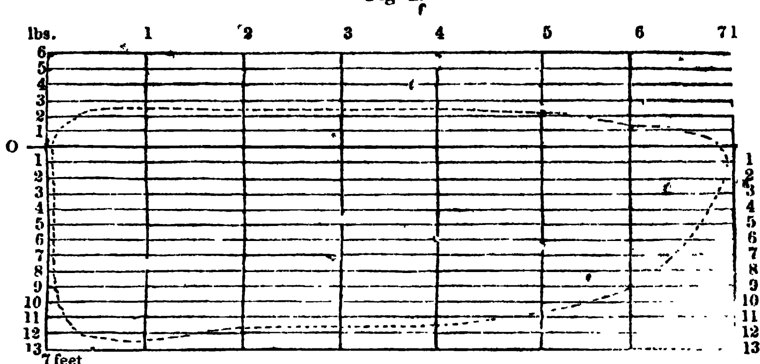


Fig. 1 is an indicator fixed on the top of the steam cylinder, and fastened to S S the stand, which is grooved at the top to permit T, the tablet, to slide backwards and forwards; G is the guide, forming part of the stand, through which the piston-rod of the indicator moves, and to which the top of the spring is fixed; P is the paper or card pinned to the tablet; C is the cylinder of the indicator, in which its piston is represented at its zero or starting point, having just completed the diagram D; the line across is the zero or atmospheric line, first formed by drawing the tablet backwards; R is the radius rod to which the tablet string is fastened. The steam piston is now on the point of commencing its down stroke, and immediately, by turning the cock, the steam is permitted to flow into the cylinder, it will press equally upon the working piston and up against the indicator piston. The descent of the steam piston slackens the line, and the weight draws the tablet to the left until the completion of the stroke, the pencil necessarily tracing every fluctuation in the steam pressure, because the indicator piston, to which the pencil is attached, is forced up with just as much power as the steam piston is forced down. By ascertaining previously the weights required to expand and contract the spring from 1 to 15 lbs., and marking the degrees accordingly, the variations in the diagram are afterwards measured by such scale, and the result ascertained; or the paper may be

previously ruled with spaces in proportion to such scale, as shown in Fig. 2. The falling off of the top line of the diagram shows that the steam pressure is

Fig. 2.



diminishing towards the conclusion of the down stroke, when the pencil has then traced from 1 to 2 (fig. 3). Exhaustion of the cylinder now commences, and the indicator piston descends by the pressure of the atmosphere (as in Newcomen's engine) as fast as the steam is annihilated. In proportion to the rapidity of the exhaustion will the depth of the curve approach to 3; for if it were

Fig. 3.

instantaneous a vertical line would be traced by the rapid descent of the indicator piston from 2 to 3. As the steam piston ascends it is drawing back the tablet to its former position—the exhaustion becomes more perfect the nearer the completion of the up stroke—and the indicator piston consequently falls lower and lower by the pressure of the atmosphere, and traces the line from 2 to 4. The steam piston has now made one down and one up stroke, (the line from 4 to 1 being made by the re-admission of steam), and the mean steam pressure and mean cylinder exhaustion are correctly ascertained by the variations shown in the diagram. If, therefore, the two registers of steam pressure above the atmosphere, and the pressure of the atmosphere above the exhaustion be added together, the gross power exerted per square inch in the piston will be readily calculated. Fig. 2 shows a mean cylinder vacuum of 10¼. The mean is calculated at every six inches, the stroke being, as shown, 7 feet. It will be remarked that the line traced above the atmospheric or zero line is considerably less extended than the tracing below it. It will readily suggest itself that this is owing to steam pressing the indicator piston up against the atmosphere, the steam being (except

in tugs) seldom above 6 lbs., whereas for the curve below there is the full pressure of the atmosphere on the indicator piston seeking to enter the partially exhausted cylinder.

I think that the engraved index attached to the indicators of this day must lead to erroneous results; because that always continues invariable, though the spring from which it has been graduated may be affected by temperature, which is well known has considerable influence on metals. Something of this kind can alone account for the indications showing as great a steam pressure in the cylinder as in the boiler, though the indicator cylinder is not even clothed to prevent condensation.

I think the superior duty of the single lifting Cornish engine is owing more to the complete exhaustion of its cylinder *before* the piston *begins* its stroke, than to any other single cause. Something is due to better clothing, and to one or two other causes, but this I believe chiefly to be the hitherto unconsidered cause. Austen's engine, and indeed all the single Cornish engines remarkable for extraordinary duty, require the cylinder to be exhausted only six or seven times a minute, whereas rotative engines require from 30 to 60 evacuations a minute, which I will show makes a difference in effective duty of at least 3½ or 4 lbs. per square inch. In the latter it is impossible that the cylinders can be completely exhausted until nearly the end of every stroke of the piston, entailing great loss of power, but in the former every stroke *begins* with as good a vacuum in the cylinder as in rotative engines it *ends* with. There must not only be cold surface to condense, but time; and however quickly steam may flow to a vacuum it cannot be condensed quicker than the injection water can flow into the condenser; or, in surface, than the steam can enter a sufficient number of pipes, and come in contact with their surfaces. In Cornish engines the piston waits at the top until this is nearly done, and then moves so very slowly as never to feel any uncondensed steam beneath it. In rotative engines the rapidity of action renders this impossible. I shall enter more fully into these questions in my next.

I am, Sir, your obedient servant,

SCALPEL.

February 12, 1841.

THE RAILWAY BREAK—(p. 184.) ERRATUM CORRECTED.

Sir,—I have just seen the number of your Magazine containing a description of my railway break and beg to call your attention to an error of your engraver. The section of the band is represented thus:

If a railway wheel were of that form there would have been no occasion for any portion of the band clipping the flange as it could not have slipped off. If should have had a form thus: being that usually given to railway wheels.

I am your obedient servant,

E. M. J.

London, March 8, 1841.

STEAM COOPERAGE.

Our attention having been recently attracted by the statements that have appeared of the extraordinary advantages secured by a new patent for the manufacture of staves, shingles, laths, and for wood-cutting in general, we were induced to pay a visit to the works at the Square Shot-tower, Waterloo-bridge, on Monday last. The machinery which we then saw at work appeared to us fully to authorise the expectations of the patentee Captain W. H. Taylor. The process is so simple, and at the same time so effectual, that it must cause an entire revovolution in the trades affected by the invention.

The wood, having been cut from the solid timber, by means of circular saws, into blocks of the requisite length and breadth, is first steamed for the purpose of softening and seasoning. The waste steam of the engine is used for this purpose. It is then cut into leaves of the required thickness with extraordinary rapidity by one or other of two sets of machines adapted for this purpose; the one being a species of iron plane working in a vertical direction, the other a large disc, containing two cutters, and performing from 100 to 150 revolutions per minute. Messrs. Bramah and Robinson have just completed a giant machine of this kind, being a disc of thirteen feet in diameter, intended for cutting hogshead staves. Such is the dynamical excellence of the mechanical arrangements, that at the expense of but two or three horse steam power, the wood is cut like cheese, without offering any apparent resistance to the knife, and without the slightest waste in saw-dust, shavings, or chips. The leaves thus cut are passed through another machine, which at the same moment bends them into the curved form

required for the shape of the cask for which they are intended, gives them the requisite taper, and bevels the edges so as to make them fit each other with a water-tight joint. Each of these machines, attended only by a boy of from eight to ten years old, is capable of turning out as many finished staves in a minute as the most experienced cooper could rend and finish in an hour.

We understand that Captain Taylor, who is also the inventor of the magnetic engine that was exhibited for some months at the Colosseum, has refused thirty thousand pounds for his patent, being desirous to carry out his invention to its full powers by the aid of a public company, which has already applied to Parliament for an act of incorporation. The simplicity and great power of the invention, the saving effected in material, in labour, and in time, and the applicability of its aid to so many articles of daily consumption, render it likely to be the means of most beneficial results to trade and to the public, as well as a most lucrative speculation for the proprietors.—*Patriot.*

MR. URWIN'S SYSTEM OF WORKING STEAM EXPANSIVELY.

Sir.—Having observed, in 912 of your valuable Magazine, an account of Mr. Urwin's recently patented system of working steam expansively, I beg to offer a few remarks thereon.

In the first place it is stated, on the assurance of the proprietors of the *Hercules* steam tug, that the saving arising from the adoption of the system on board that vessel has amounted to upwards of 40 per cent. in fuel.

This I conceive to be feasible, when it is understood that one half only of the steam required to charge the cylinder per revolution, when working in the ordinary way, is employed in the patent engine.

The same result as regards the fuel would obtain, it is clear, (assuming the same number of revolutions per minute) in the event of the steam being cut off at the half stroke, both in the ascent and descent of the piston. The mechanical effect, however, in both cases, is less than when the dense steam is caused to follow the piston to the extremity of the stroke.

"Alpha," whose views of the subject in No. 914, I consider to be substantially correct, estimates the mechanical effect of a certain volume of steam worked expansively in Urwin's engine, compared with the same *twice* measured in the cylinder by cutting off at the half stroke, to be as 26 to 35:—the relative effect of Urwin's engine, however, is here somewhat underrated, under the circumstances taken,—26 : 33¾ being a nearer approximation.

The effect, were the expanding chamber of larger dimensions, as suggested by the patentee where room is not a consideration, would be still less: not only from the reduced pressure consequent on the expansion, but from exposure, moreover, of a larger surface for radiation,—which, in every case, will be much greater than where the steam is confined to the cylinder alone.

In his specification, Mr. Urwin has observed, that when the piston has descended past the lower steam way D (vide frontispiece No. 912) the steam from the upper part of the cylinder rushes into the expanding receiver and beneath the piston at the same time, by the vertical groove *g*: this last portion, it is stated, assists in producing an immediate reverse action of the piston, and in carrying the top of it past the steam way D.

Now the reverse action cannot be so produced, inasmuch as the piston after passing the port D has the steam both above and below it, being carried to the termination of its stroke downwards by its momentum; and being unable, without the assistance of a fly-wheel, or other regulator of varying power, to return past the port D where the vacuum commences to give effect to the steam beneath. This is evidently a practical defect.

In conclusion, I submit my impression, that the reduction in the speed of the *Hercules*, due to the diminished power after the adoption of the expanding receiver, must have been very palpable on trial, unless the engine had previously been in very bad working order.

I am, Sir,
Your most obedient servant,
NAUTICUS.

Woolwich, March 8, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM COLTMAN AND JOSEPH WALE OF LEICESTER, FRAME-SMITHS, *for improvements in machinery employed in frame-work knitting or stocking fabrics.* Enrolment Office, March 6, 1841.

For the purpose of being driven by a single main shaft, several machines are placed within the same framing, through which the shaft passes, furnished with as many cog-wheels as there are machines to be driven. Each of these wheels is made fast or loose upon the shaft at pleasure by means of a clutch box sliding on the shaft. By working these coupling boxes, any one of the series of the wheels can be disconnected from the shaft, which will revolve without it; thereby enabling each machine to be stopped or started as required, quite independently of the rest. The motion of the driving-wheels is communicated to the machines by wheels and levers in the usual manner.

The second improvement refers to the mode of working the jack-sinkers; the jacks which are shorter than usual, instead of moving on an axis passing through them as heretofore, rest on what the patentees call a "jack-bar." The jacks, instead of being connected by a pin joint to the sinker, are connected to a sliding bolt, which bolt is connected by a pin joint to the sinker. The sliding bolts are guided vertically by combs, and their position as regards the front and back of the machine is adjusted most accurately by means of gauge bars.

Thirdly. A toothed rack is formed on each of the bars to which the tickling points are fastened, by which they can be moved in opposite directions, to cause the tickling points to be correctly placed, so that in entering the machine they will come directly on to the beards of the three external needles, on which there are loops at each salvage of the fabric, in order to take up the loops therefrom and carry them in towards the middle of the width of the fabric, a distance of two needles; so that when these loops are again placed on needles, there will be one loop on the outermost needles at each of the salvages, and two loops on each of the next two needles, reckoning towards the middle of the fabric. For the purpose of stopping the machine at proper periods, in order to narrow the work there is a suitable arrangement of wheels and levers, which act upon the coupling boxes previously described.

Fourthly. There is described an improved method of constructing jacks, which consists in placing the tails of the jacks beyond the axis of motion, and instead of applying the jack springs to their tails behind the axis, the springs are placed in front, and a hook is formed on the front upper surface of the jack.

The claim is to 1. The mode of constructing and applying framing to machines for making stockings and knit fabrics, whereby several machines may be driven by a single main shaft, and each stopped and started without reference to the others in the same framing.

2. The mode of applying sliding-bolts, and parts connected therewith, for working the jack-sinkers of machinery for making stocking and frame-work knitting fabrics.

3. The mode of applying tickling points and bars; and the means of stopping the machinery at the proper times for narrowing the work.

4. The mode of constructing jacks of jack-sinkers, and the mode of applying springs thereto.

Mark Freeman, of Sutton Common, Gentleman, *for improvements in weighing machines.* Enrolment Office, March 10, 1841.

These improvements are twofold, and relate in the first place to a new mode of constructing weighing machines, for weighing letters and other articles. Secondly, to a mode of constructing weighing machines suitable for analytical and other purposes, when exceedingly minute matters are to be weighed.

The principle embodied in the first construction is just the opposite of that patented by Professor Willis, whose weighing machine was fully described at page 148 of our last volume. In that case, the weighing was effected by taking up in succession a series of weights; in the present instance, only one weight is employed, but the beam is made to take a fresh bearing or point of support by every increase of weight in the body whose weight is to be ascertained.

From the top of a pillar, or stem, rises two side frames, slightly arched on their upper surface, in which is cut at proper intervals a series of notches; the beam consists of a long bar having a globular, or other-shaped weight at one extremity, and a hook or scale-pan at the other. A series of cross arms (equal in number to the notches,) terminating at both ends in knife edges, are placed across the beam, and support it by resting in the notches on the upper edges of the side frames.

When not in use, the beam is supported by the arm nearest to the weight; but on placing a letter, or other article weighing half an ounce in the scale, the beam is drawn down and takes a new bearing upon the second arm, and so on with any greater weight. A pointer descends from the beam, and traversing before graduated scale indicates the value of the disturbing force. In order to remedy a difficulty (which the patentee asserts to exist) in obtaining weights small enough for the analytical purposes of the chemist, and to weigh quantities of matter too minute to be indicated by ordinary weights and scales; the patentee constructs a balance of unequal arms. The relative proportions of which, may be as 1 to 10, 20, 30, 40 or any other equal multiple, when the body weighed will only be the tenth, twentieth, &c. of the weight employed, which is placed in the scale hanging from the shorter arm of the balance. The equilibrium of the beam is produced by hanging a counterpoise weight from its shorter end. We cannot help thinking that the *utility* of either of these contrivances is exceedingly doubtful, and we strongly suspect the balance of unequal arms is much too old a contrivance to form the subject of a valid patent.

Charles Dod, of Buckingham-street, Adelphi, Gentleman, *for certain methods or processes for the manufacture of plate glass, and also of substances in imitation of marbles, stones, agates, and other minerals, of all forms and dimensions, applicable to objects both of use and ornament.*—Rolls Chapel Office, March 10, 1841.

These processes are for the manufacture of masses of colourless or coloured glass, in at one and the same time, giving them the forms which indicate their use; such as slabs, table-tops, chimney-pieces, vases, cups, columns, in short, objects of all forms and dimensions; and whereby those difficulties which have hitherto existed in casting or running glass direct from the melting-pot into moulds of the required forms are avoided.

Also, for the manufacture of coloured glasses and other vitrified substances, with veins, rays, or stratifications, and in imitation, both as to their colour, breaks, veins, rays, &c., of marbles, and stones of all kinds, as jasper, agate, porphyry, onyx, lapis-lazuli; and rivalling them in beauty and brilliancy.

For this purpose, glass of any sort, either coloured or colourless, is placed in moulds of fire-clay, the interior of which is coated with a mixture (in equal proportions) of plaster of Paris and talc. Pieces of glass are then to be arranged according to the design to be produced, within the mould, which is to be placed in an oven or muffled furnace, and the temperature raised till the pieces of glass are partly melted and unite, being soldered as it were together, forming a single solid mass. To make vases or columns, moulds made of fire-clay and coated on the inside, as before directed, are to be prepared. Funnels of fire-clay are placed over the moulds, through which melted glass is poured, which fills up all the cavities remaining between the several pieces of glass previously contained in the mould, which become homogeneous by exposing the mould to a farther degree of heat, as before stated.

With muffled furnaces or ovens, the patentee states he is thus enabled to unite into masses of all dimensions, glasses of every description, and even minerals directly from a natural fusion, as basalt, &c. To succeed perfectly, it is essential that the heat received by the mould should be greatest below, because if the air contained between the pieces united by the fusion should be enveloped within, it would leave cavities, or produce ebullition highly detrimental to the effect sought. The furnaces or ovens employed for these processes, therefore, are to be heated from beneath, and the heating, as well as the subsequent cooling, are both to be performed very gradually, so as to effect the perfect annealing of the articles.

The patentee has found that a globule of glass containing a metal, was reduced to a transparent state by the simple fire of reduction, and that on applying to such globule the fire of oxidation, the metal assumed the colour peculiar to its oxide. Thus, "silver reduced to the state of sulphur, after having divided it by a dissolution and precipitation of any sort, calcined with an equal quantity in weight of pulverised sulphur, will give, introduced into a composition of flint glass in the proportion of one part in two or three thousand, a transparent glass, tinged only with a clear yellow; the same glass submitted to the fire of oxidation becomes opaque, and of a whitish yellow throughout its mass, there remaining only a small portion of transparent glass, which interposed between that which has received the colour, produces the most varied effects of stratification." All articles thus made are to be finished and polished in the usual manner.

The application of these methods and processes upon a large scale will, it is said, effect a great saving in the manufacture of glass, and will also introduce new substances in the manufacture of those objects of use or ornament, to which at present marbles, stones, agates, and other minerals, are almost exclusively devoted.

The application of talc to prevent the materials from adhering to the moulds, is stated to be merely an application upon a large scale of the use made of it by manufacturers of cameos, artificial eyes, &c.

The claim is, to the methods and processes hereinbefore described, for the several purposes they are severally and respectively applied to.

GEORGE ALEXANDER GILBERT, LATE OF SOUTHAMPTON-BUILDINGS, CHANCERY-LANE, BUT NOW OF NORFOLK-HOUSE, BATTERSEA, SURREY, GENTLEMAN, *for certain improvements in machinery or apparatus for obtaining and applying motive power.*—Rolls Chapel Office, March 10, 1841.

This invention or improvement consists in certain novel features in the construction of engines to be actuated by steam, air, gas, or other elastic fluid, whereby the ponderous cylinder heretofore employed is dispensed with, and in its place are substituted certain tubes which slide one within the other, in the same manner as the tubes of a telescope, from which cause the patentee denominates them "telescopic tubes." That part of the present engine which is intended as a substitute for the ordinary cylinder, consists of two tubes, one end of which is bolted to a steam box or chamber, divided into two compartments by a division in the middle. To each end of the frame-work of the engine, stationary tubes are affixed, upon which the former slides backward and forward. The ends of the two sliding tubes are furnished with stuffing boxes to keep the joints steam-tight. There is a communication at the extreme end of each of stationary tubes, with the steam boiler and condenser, opened alternately by slide valves worked by eccentrics on the engine shaft. The steam-box

or chamber is furnished with cocks on its under side, for the purpose of discharging any air, water, &c., it may contain, previously to starting the engine. The steam-box and tubes are mounted on friction-rollers which run in grooves cut for the purpose in the sides of the frame work. Steam being admitted into the stationary tube at the one end, while the opposite one is open to the atmosphere or to the condenser, the sliding-tubes and steam-chamber move towards the latter; the position of the slide-valves being then altered by the eccentrics, the communications are reversed, and hence an alternating motion backward and forward, if the apparatus is placed horizontally—or an up and down motion, if the apparatus is arranged vertically—is produced, which alternating movement is converted into rotary motion by connecting rods, crank, and fly-wheel, in the usual way.

The patentee observes, "I would wish it to be understood, that although I have generally mentioned steam as the vapour employed for actuating the engine, yet sometimes I employ air or gas under certain circumstances, and find them more economical than steam. I therefore do not intend to confine myself to any particular fluid or fluids for actuating my improved engine; nor do I confine myself to the precise arrangement of parts shown in the drawing, as I sometimes construct the engine in such a manner that the sliding-tubes shall move up or down perpendicularly instead of sliding in the horizontal manner herein described. Lastly, I desire it to be understood that I claim as my invention, the mode or method of producing motive power by the use of steam, gas, or any other fluid conjointly or separately, as before described.

Paul Hannuic, late of Paris, but now of Clements Lane, London, *for improvements in the construction of governors or regulators applicable to steam-engines, and to other engines used for obtaining motive power.* Enrolment Office, March 10, 1841.

This specification opens with a long enumeration of the defects of the ordinary pendulum governor: particularly the oscillating nature of its action between extremes, and its want of power when applied as a regulator to water gates, &c.

The substitute for this imperfect contrivance, consists of a pair of bellows, in three parts, placed one above the other; a small crank shaft worked by the steam-engine, or other prime mover, gives an alternating motion to the two lower divisions of the bellows, by which a quantity of air is forced into the upper division or reservoir. There is a hole in the upper plate of this reservoir, through which the air escapes, the aperture being so regulated by an adjustable valve, that it shall only escape at a given rate. Should the speed of the engine exceed the prescribed limit. The air is forced into the reservoir faster than it can escape through the valve, and the consequence is, that the upper plate of the reservoir is lifted, and by means of suitable levers, &c., partially closes the throttle valve of the steam pipe. The same movement also partially closes a damper in the furnace chimney, so as to regulate at the same time both the production and the supply of steam. Two or three modes of regulating the aperture for the escape of the air are shown, but the patentee does dot confine himself to any precise arrangement. The same apparatus is to be applied to govern the speed of water wheels, for which purpose several forms of water gates are shown, moving with greater ease than the ordinary ones, so as to be acted upon with great facility by a small power.

The claim is 1, to the construction and arrangement of an inflated reservoir, cylinder, or receiver, supplied with atmospheric air, gas, water, or other liquid, by means of the moving power which it is designed to govern or regulate.

2. The combination of such inflated reservoir, cylinder, receiver, or other governor, with a vane or damper in the furnace flue or chimney, by which the intensity of the fire is governed and regulated according to the speed of the engine or the supply of steam.

Henry Houldsworth, of Manchester, Cotton Spinner, *for an improvement in carriages used for the conveyance of passengers on railways, and an improved seat applicable to such carriages, and other purposes.*—Enrolment Office, March 6, 1841.

This invention comprises two objects; 1. To combine in some degree the pleasure of outside, with the comfort of inside travelling; and secondly, to economise the space occupied by seats, where space is an object, and to protect out-door seats from the weather.

The first of these objects is accomplished by covering the carriage either wholly or in part with metallic wire gauze, cloth, or net, of a texture sufficiently close to break the force of the wind, and destroy the violence of the currents produced by rapid motion through it; and also to impede the entrance of the particles of coke-dust emitted by the locomotive engine chimney, and yet not materially to obstruct the view of external objects.

The second, by the use of seats constructed so as to turn or fold up of themselves when not in use, by the action of springs or weights. A railway carriage is described, in which the lower frame of the carriage, the springs, axles, wheels, &c., are the same as in the ordinary railway car-

riages; the dimensions are, 18 feet long, by 7 feet 9 inches wide, and 7 feet 9 inches from the floor to the highest part of the arched roof. The side panels are carried up about three feet above the floor, and terminate in rails extending the whole length of the carriage, and morticed on to the tops of the upright framing posts. The ends of the carriage are framed and carried up to the height of the roof, and are circled to correspond with the arched covering. From the uprights of the side framing, which are two feet apart, brackets project outwards about six inches, from which spring a series of arched ribs, forming the framing for carrying the wire gauze covering, and the roof. In the centre of the carriage, an upright pillar from the floor to the ridge-pin of the ceiling forms a further support for the roof. At each side of the carriage, at opposite diagonal corners, are the doors. Along the upper part there is a boarded water-tight roof 5 feet 9 inches in width, and on each side of it extends a string rail for leading the rain water down grooves into small pipes which convey it to the ground. In addition to the covering of wire gauze, over the upper compartments on either side of the boarded roof are placed water-proof curtains, mounted on suitable rollers, so as to be rolled or unrolled at pleasure by the persons in the carriage. The wire gauze recommended, is of copper wires $\frac{1}{100}$ of an inch in diameter, woven with about thirty wires to the inch; sometimes brass wire, or brass wire coated with platinum may be used, and are claimed for this purpose. The carriage described is intended to accommodate thirty-two passengers; seats for sixteen are arranged on a stage 3 ft. 6 in. wide extending lengthwise of the carriage, and raised one foot above the floor, so as to form a convenient depository for small articles of luggage, and to enable the parties occupying these seats to have a good view of external objects. The other sixteen seats are disposed down the sides and at the ends of the carriage. These seats are constructed so as to fold up the moment they are unoccupied, by the action of weights or springs. Two modes of construction for effecting this object are shown, as also a retarding apparatus, but the patentee does not confine himself to any particular arrangement for accomplishing this object. The application of the same principle to garden-chairs is also shown. The patentee describes the chief feature of his invention to consist in the application of the principle, that in the passage of air through wire gauze, hair cloth, or other interstitial materials, the violence of the current is destroyed by their resistance; and that adopting this principle he covers, or partially covers carriages used for the conveyance of passengers on railways, with wire gauze, hair cloth, or other interstitial fabrics or minutely perforated metals, which protects passengers from the force of the wind, and currents of air produced by rapid motion, and also serves the important purpose of preventing the entrance of coke dust emitted by the locomotive engine, without materially impeding the view of external objects; and claims, generally, the use or application for the purposes hereinbefore specified, of wire gauze, hair cloth, perforated metal plates, and other interstitial or perforated fabrics.

The patentee does not confine himself to the use or application of these materials to the covering or partial covering of carriages, or as a substitute for, or in addition to glass, in such carriages only as are in accordance with the foregoing description; nor to the materials mentioned. Neither does he confine the use of the seats to railway carriages only; but to conveyances of every description—to steam-boats, sailing packets, and in every situation where seats are used, and economy of space is an object. He also claims their application to garden-seats, and wherever seats are exposed to the weather, so as to protect them therefrom.

NOTES AND NOTICES.

Ericsson's Screw Propeller.—The appearance of a small steam boat on the canal in this city, where it had arrived from Banbury on Wednesday, excited considerable attention. The *Fire Fly*, the property of Mr. H. Warriner, of Bloxham Grove, is of about two horse power, and fitted with a locomotive boiler, vibrating engines, and Ericsson's screw propeller, now about to be applied by the American government to ships of war. The perfect and beautiful action of the boat and machinery was clearly demonstrated by the speed attained, being about nine miles an hour, which is very considerable for so small a craft. The engines were planned and conducted by Mr. Warriner himself, a pupil of Messrs. Brathwaite and Milner, of London, at their manufactory; and the boat was built at the yard of Mr. Roberts, of Banbury. We were much pleased on viewing her on the Thames yesterday and the day before: her motion was extremely smooth, the propeller being fixed in her stern. Several highly respectable persons took a trip in this elegant vessel yesterday, amongst whom we noticed C. Tawney, Esq. Mayor, with Miss Tawney, Thomas Robinson, Esq., and Guy Thompson, Esq., of the Old Bank, &c. &c.—*Oxford Journal*.

The Great Western.—An awkward mistake was made the week before last in substituting the name of the *British Queen* for this vessel, in a paragraph among our "Notes and Notices." It was the *Great Western* and *not* the *Queen* which has been found on examination to be in so remarkably sound and sea-worthy a state.

Errata.—At page 195, first col., tenth line from the bottom, for "intersection of H I to C," read, "intersection of H I to L."

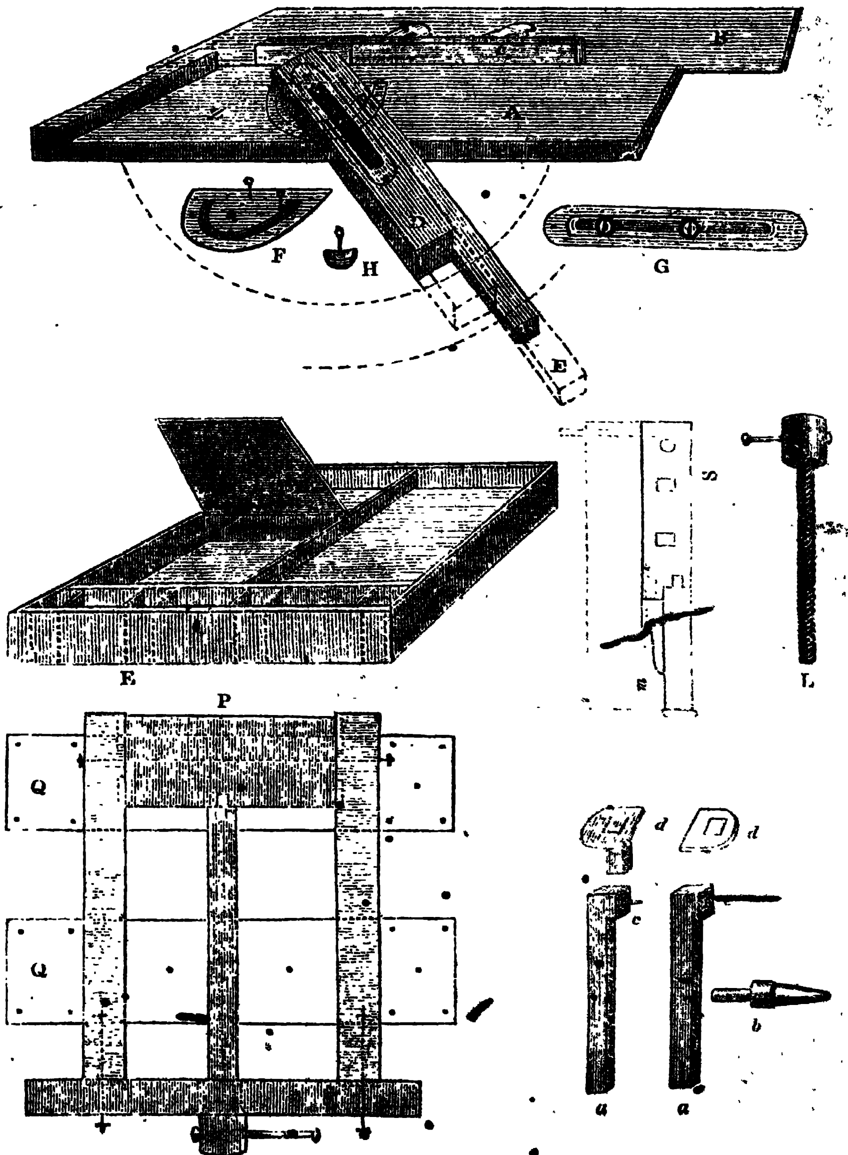
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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 920.] SATURDAY, MARCH 27, 1841. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-stre

FIELD'S IMPROVED CARPENTERS' BENCH.



Sir,—In the 29th vol. of your widely-circulated Magazine, page 454, is a drawing of an improved carpenters' bench, but your kind correspondent, "P. O.," has omitted delineating and explaining some very material parts connected with the improvement; which omission I should attribute to the want of a technical, or practical knowledge of the construction and uses of the connecting parts forming the bases of such improvement, thereby leaving a barrier in the way of its becoming generally useful.

As I herewith forward you a sketch of a cabinet maker's bench, having parts of similar contrivance, I shall refrain pointing out such omissions; trusting your readers (and those of the trade particularly), will perceive by the plan I have sent, what is deficient in that inserted by "P. O."

Having for the last twenty-five years been connected with the cabinet department, I have had every opportunity of becoming acquainted with the different construction of benches commonly in use by carpenters and cabinet makers of this country; but I must in justice say, I have met with none equal to those in general use among our Transatlantic friends, both as regards convenience, and the facility they give to work, their construction, and strength, and appearance generally.

The sketch I have herewith sent, is from one which I made for my own use when in New York, and is principally after the model of those used by the trade in America, with a few alterations and additions of my own. Being rather costly, I thought it worth the expence of bringing it with me to England; having had it in constant use for the last six years, I have had sufficient proof of its utility and usefulness, and have found it to answer every good purpose I could wish, and during which time, I have never had occasion to make the least alterations or repairs.

Should you deem the same worthy of a place in your valuable columns, I shall esteem it a favour by giving it insertion accordingly.

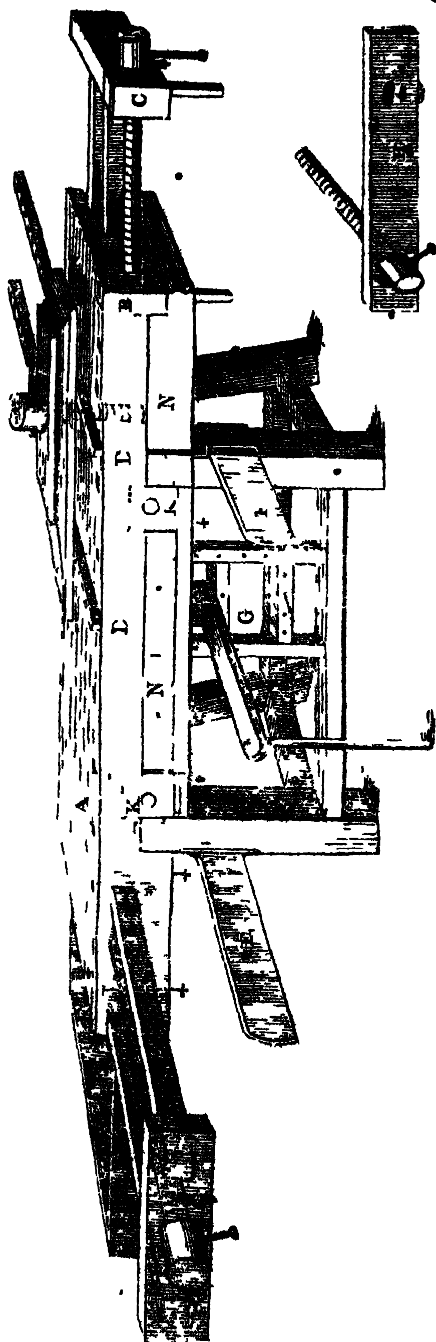
As one of the leading points connected with benches of this construction, in order to insure steady and uniform movements of the different parts, is the selection of compact and well-seasoned materials; I shall describe the method I have adopted, and the woods I have chosen to insure this end, and my reasons for so doing.

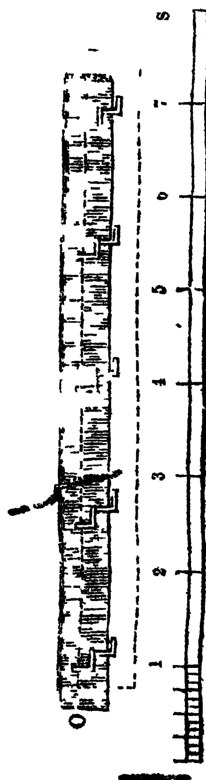
In the first place, I have made use of foreign woods, as they are well known to be less affected by changes and humidity of temperature, are more hard and durable, and not so susceptible to the ravages of worms as those of home growth. By jointing two pieces together of similar density, the grains are crossed, and act in opposition one to the other, preventing thereby any warping, providing always that they are well seasoned and firmly glued together.

My motive for having the outer surface of satin wood, is that it has a good appearance, and if I may use the phrase, is combined with economy in more instances than one, viz.: first, from the light colour of the wood, the eye readily at a glance catches whatever may be lying on its surface, thereby making a saving of time in taking up whatever tool is requisite; in the next place, when working by candle-light, a still more obvious advantage is perceptible, as the light is reflected back, thereby enabling one candle to give a light nearly equal to two with a dark ground; it is more cheerful too without distressing the eyes.

Description of the plan of the Bench.

The top A, (see opposite page) is 8 feet 3 inches long, by 2 feet 2 in. wide, made in two widths; the front plank is composed of 3½ in. zebra wood, 15 in. wide, the back of 1½ in. mahogany, 11 in. wide; each plank is separately faced with 1½ in. satin wood; the back piece is jointed to the front by a tongue and groove formed in a rabbet in the front plank made to receive it; the ends also are tongued, and run in grooves in the clamps at the ends marked B, which are of 3½ in. satin wood, and 8 inches deep. The clamps are dowelled on the ends of the front plank, and glued fast, and further secured by strong iron screw bolts, passing through them into the end of the plank. The apparatus C, at the tail end, extends the extreme width of the top, and by means of the two guides and screw, when opened out, gives an additional length to the top of 2 feet more. On the end of the extending chop at *g*, is a wood stop which turns on a centre, to saw against, and turns down when not required. The above apparatus answers the same purpose as the


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7
S

slide in the end of the front of the plan given by "P. O.," with the double advantage of giving length and bearing to the top—being more powerful when used as a cramp, and less liable to get out of repair by overstraining; the two cramping irons, *a a*, are made to slide through the clamps as shown at B and C, that of B, shifting along the top in the square holes on its front edge, to suit the length required to be taken in. The irons are about 10 inches long by 1¼ square, with a sunk spring on one side to keep them up to their required height when in use; the faces of each, project about ½ of an inch, and 1¼ inch down, and are serrated; *b* is an iron centre, fitting into the face of the same at *e e*, used when work is required to turn round; *d d*, are two steel plates, ⅜ths of an inch thick, with their face edges serrated; their use is to carry the point of bearing to the front of the top when narrow widths are requisite to be held, flush with the face of the top, or to hang over (the square holes being 2 inches from the front edge,) the holes B and C, and the clamps. At the head of the bench are stout brass castings dovetailed in, lapping at the edges, and screwed fast, to prevent the cramping irons *a a*, splitting, or forcing off the clamps when under pressure. D D D, are three drawers for holding tools, &c., the centre one fitted up as a writing desk, as shown at E. F F F, are three supports, answering the purpose of a sawing stool, sliding in brass sockets, let in and screwed fast to the sides of the legs, the middle one moving transversely with the sliding frame G; it has also a shifting leg, to counteract the strain on the opposite or socket end. The sliding frame G, has holes in it to receive a moveable pin used to support the opposite end of a board when in the screw C. H is a long shifting chop, fitted with wood screws and working in nuts at K, as shown by dotted lines. L is one of the screws removed, to show the oval form of the hole in the chop H, to allow one end to recede while the other closes; its use is to secure work of wedge or taper form, as represented by the line above; the shoulders of the screws are slightly rounded to suit the inclination required. M is a screw clam, working through the top of the bench. N N are intended to represent two pieces secured by the same, while mortiseing, and are used instead of the common figure of 7 shape iron hold-fast in general use for that purpose; it is more readily shifted, holds firmer, and saves the mallets from the injury sustained by driving the iron one into the hole of the bench. O is a ledge at the back edge of the top to prevent tools falling off; it is made to shift down or up as required, by means of two-sided or right-angled mortises, working on the neck of screws. The dotted line represents its position when let down. This plan I consider far superior to a trough at the back, which is not only unsightly, but is a common receptacle for dust and shavings, and I am thoroughly convinced is a very material loss to the employers in the course of the year, in nails, screws, &c., that are constantly swept off with the dust collected in the same, to save the trouble of picking them out.

At P, (see opposite page) is shown the plan of the framework to the head vice C; the shaded part showing the screw, chop, and runners. Q Q are clamps notched out to receive the same, and screwed fast to the underside of the top to keep them steady. The various dotted lines throughout the plan, are intended to explain the manner in which the whole is put together, the position of the different screws, bolts, &c. E is the middle drawer with a double front; showing by dotted lines the places where the cramping irons pass through without interfering with the things in the drawer; the intervening spaces being used for ink, wafers, &c.

S, is an end section of the bench, showing the brackets *m* screwed fast to the underside of the back-piece, the ends being firmly tenoned into the front plank and made to shift. Through the brackets, lengthwise, pass strong iron bolts with screws and nuts, which keep the two planks at all times to a joint, and enable the top to be separated when required; the shoulders of the brackets being set back a trifle to allow the coming up of the joint. The whole of the bench is portable, and takes to pieces if necessary for moving.

The top fig. on the front page is a plan I have contrived for a moveable mitre block, to make a mitre of any angle; it is attached to a common shooting board. A the board, B the piece on which the plane C runs, D the moveable stop, working round by means of screws passing

through the mortise into the brass quadrant inserted into the board. A, the top screw, being stationary to the lower plate, acts as a centre on which the block D turns, while the lower screw works round in a kidney-shaped nut in the grove, on the underside of the brass quadrant Z. To alter the angle of the mitre it is necessary to slacken both screws; the mortise in the upper plate allows the block D to shift up or down, in order to bring its upper angle in a line with the face of the plane. F is the quadrant plate and screws, G the top plate, H the moveable screw and nut.

The advantage this mitre board has over the common ones, will readily be perceived by persons in the habit of making mitres; particularly where the work is veneered on the back edge, or is cross-grained, or of brittle wood. In making mitres it frequently occurs that it is necessary to take more off from the point of the mitre; to do which, it is requisite to bring the piece round to more of an obtuse angle, by which means, in the ordinary mitre board, the point of the mitre is left without a bearing at the back; the result of which is, in nine cases out of ten, the breaking off of the point. To obviate this, by the plan I have adopted, all that is required is merely to give the shifting block a slight tap with a hammer on its lower edge, and the bearing is brought round to the angle required; the contrary way, if wanted more acute.

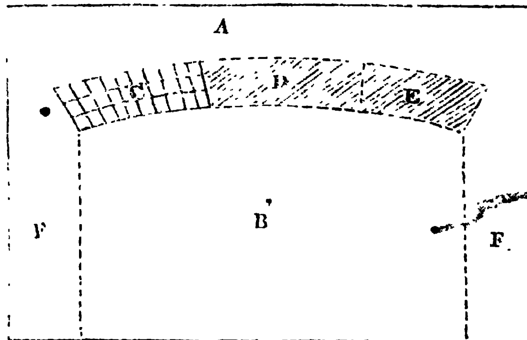
Submitting these plans and descriptions for your approval, and if worthy for insertion in your valuable work,

I remain, Sir, your obedient servant,

S. H. Field.

Evesham, Mechanics' Institution, March 16, 1841.

IMPROVED METHOD OF CUTTING ARCH-WAYS, IN WALLS.



Sir,—I beg to hand you a plan for cutting an arch-way through a wall, without using either shores or centres. I have found it a great saving both of labour and expence.

I am, your obedient servant,

John Combes, Archt.

Imperial Saw Mills.

Description of Engraving.

A, the wall through which it is intended to cut the opening B. I commence with perforating a hole of the size and shape shown at C; and lay a smooth coat of mortar on the under curve line of C, which forms a centre, and upon which I set the portion of the arch marked C, 3 or 4 inches in cement, and pin up the wall over D; I then cut the openings D and E, and continue in the same manner until the arch is completed. After this I cut out the centre wall B, and make good the piers F with mortar, or cement when the brickwork is loose, and the work is then complete.

IMPROVEMENT OF FURNACES.

Sir,—Although many improvements have been suggested, and many have been made in the construction of furnaces, I think there is still room for

much greater. I have made some experiments on a small scale, and the results warrant me in asserting, that a great change must soon take place in the management of large fires, especially where steam or other power is employed. The method I would recommend is as follows:—Place a valve in the chimney a little above the furnace to be regulated to any position by a register; for the sake of distinction, call it the "Throttle Valve." Fix a trunk (capable of conveying a sufficient quantity of air to support combustion,) near the bottom of the ash-pit, the further below the fire the better; close the ash-pit with an air-tight door. An air pump or some absolute means must be employed to force the air through the trunk into the ash-pit, (a fan blower will not do,) when it will become considerably rarefied before passing through the fire. The quantity of air used may be optional, but for the sake of a comparison, measure the quantity passing through the fire in the common way in any given time, and let the same quantity be driven through in the same space of time. Fix a valve in the air trunk with any degree of weight on it, but in this instance a pound on the square foot will suffice. Register the "Throttle Valve" so as exactly to balance the trunk valve: there will then be a pressure of one pound of heat on every square foot of surface, both of boiler and furnace, while, in the common way, there is scarcely any. The combustion will also be more complete, and when properly carried out, the advantages will be surprising.

I am, Sir, your most obedient,

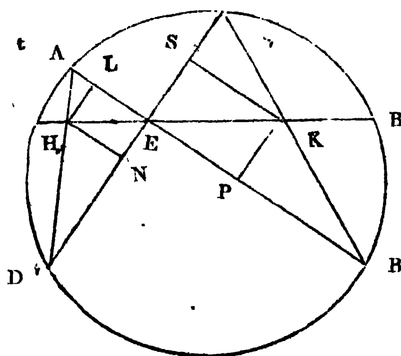
S. K.

Great Pulteney-street.

P. S. Since writing the above, I have been told that a Frenchman holds a patent for something like it, but whether it embraces the whole principle I cannot learn.

SOLUTION OF KINCLAVEN'S GEOMETRICAL THEOREM. BY MR. GEORGE SCOTT.

Sir,—In the circle A B C, let the two chords, A B, and C D, intersect one another in E. Join A D, B C, and through E draw, any chord F E G, intersecting A D, B C in H and K. Then will F H, H G, G K, K F : : H E² E K².



Draw H L, K P, H N, K S, perpendicular to A B and C D.

By similar triangles H L : K P : : H E : E K; and, H N : K S : : H E : E K; compounding H L . H N : K P . K S : H E² : E K²; again, by similar triangles, D H : H N : : B K : K P; and, A H : H L : : C K : K S; hence, A H . D H : H L . H N : : B K . C K : K P . K S.

But, A H . D H = F H . H G; and B K . C K = G K . K F; hence, F H . H G : G K . K F : : H L . H N : K P . K S : : H E² : E K². Wherefore, &c. Q. E. D.

Cor. If F G is bisected in E, then F H . H G : H E² : : G K . K F : E K², and by composition F E² : H E² : : G E² : K E², or F E : H E : : G E : K E. But F E = G E; hence, H E = K E.

The cor. which we have deduced from Kinclaven's General Theorem, is one of the Cambridge problems, it was sent me many years ago for solution, by my old pupil, the late lamented Captain Thomas Drummond, of the Engineers, Under Secretary for Ireland.

GEORGE SCOTT,
Private Teacher of the Mathematics.

21, New Church-street, Grove Road,
March 17, 1841.

REMARKS ON URWIN'S PATENT METHOD OF WORKING STEAM EXPANSIVELY.

Sir,—Is not Urwin's system of working engines inferior to the common method of working a similar quantity of steam, expansively, by the excess of power, uselessly developed in the re-

ceiver, and not exerted on the piston during expansion, above the power saved in it at the termination of each double stroke? Supposing the cylinders in both cases were of 100 cubic feet capacity, and that this quantity of $\overset{\text{lbs.}}{14.7} + \overset{\text{lbs.}}{6.3} = 20$ lbs. steam pressure per square inch were supplied for each revolution of the crank, or double stroke; it is clear that a cut off valve is a much less expensive and weighty contrivance than a receiver of 150 cubic feet capacity; and it is obvious that 100 cubic feet of steam would, by means of a cut off valve, make two half strokes of full pressure, and two half strokes at a pressure gradually decreasing from 20 lbs. to 10 lbs. at the end of the stroke, equivalent to a mean pressure rather less than $\frac{20+15}{2} = 15$ lbs. say 14 lbs., while the four half strokes would produce $\frac{20+14}{2} = 17$ lbs. per square inch mean absolute steam pressure to overcome resistances of all kinds. Neglecting temperature corrections, and other minor points, which would but slightly affect the comparative results, a rough approximation may now be attempted of the more complex expansion of Urwin's system of working engines. In this case, as soon as the 100 cubic feet of steam has made the down stroke of the piston, it is expanded into the receiver of 150 cubic feet capacity, and becomes 250 cubic feet of 8 lbs. steam, without any developement of power on the piston; but as the receiver is already filled with about 150 cubic feet of 7 lbs. steam saved from the preceding stroke, this steam also expands into 250 feet of 4 lbs. steam, forming together 250 feet of 12 lbs. steam. Now, 100 cubic feet of this steam is immediately condensed, leaving 150 feet of 12 lbs. steam to gradually expand during the up-stroke to 250 cubic feet of 7 lbs. steam—100 feet of which is condensed, and 150 feet saved for the ensuing double stroke; hence the mean absolute pressure on the up-stroke is less than $\frac{12+7}{2} = 9\frac{1}{2}$ lbs., and in the two strokes combined $\frac{20+9\frac{1}{2}}{2} = 14\frac{3}{4}$ lbs. to overcome as before resistances of all kinds.

The probable loss is above 2 lbs. per square inch, or 12 per cent. in comparison with the common method of expansion.

The principal question to be practically determined is the actual steam pressure in the receiver of the 150 cubic feet of steam saved at the end of each double stroke; and the calculation must be altered for or against the engine, according to the result shown by a barometer attached to the receiver. Care, however, must be taken to prevent the practice of any trickery by means of the cock which forms the communication between the receiver and boiler: in fact, no experiments would be satisfactory on that point, unless this communication was effectually closed. Expansion on the common plan seems now to be used more or less, according to circumstances, in the larger steamers; and it has long been common in the steam-boats belonging to the eastern part of the United States.

If I may be permitted to advert to another subject, connected in some degree with expansion, I would ask, whether any superiority exists in Cornish lifting engines of an equal size over rotatives in all cases? The report of "Work performed by steam-engines in Cornwall, December, 1840, published under a newspaper stamp, and termed Lean's Engine Reporter," points out a class of rotative engines, whose duty exceeds that of the lifting engines of the same size, though it falls much short of the duty performed by many of the larger lifting engines. There are seven lifting engines reported, the size of whose cylinders are from 30 to 36 inches in diameter, and their stroke from six to eight feet—their mean duty is 36.4 millions, the highest being 56.8 millions. There are also three other engines with a nine feet stroke reported—one 39 inch cylinder performing 35.9—one 40 inch performing 45.6—and a third 27.7 millions, averaging just 36 millions—while the same report contains three single acting and two double acting rotative engines employed in stamping ore, which average 51.4, the highest double being 54.4, and the highest single acting being 56.9 millions—they have all a nine feet stroke except one, in which it is 10 feet. These engines are worked under conditions, I suspect in regard to steam,

very similar to that of the steamers of Eastern America; but this subject is only brought forward for the purpose of pointing out the propriety of a strict definition of the class of rotative engines used in comparison with Cornish lifting engines.

Marine engines have now more or less, in many cases, assumed the character of expansion engines, and are partially clothed—conditions at one time peculiar to Cornish engines. It may be asserted, and I should agree in the opinion, that the statements which have been extracted from Lean's Engine Reporter, render a return such as has been proposed by Scalpel of greater importance: feeling a strong interest in the exposition of his theory, I think he would prefer that his attention should be called to some minor points, than that they should be used as objections.

I refer to the principles on which the Cornish return is founded—the water load and its equivalents—and the consequent omission; 1st. Of the weight of the rope and bucket in the drawing engines, the duty of which is extremely low; 2nd. Of the friction and resistances overcome in the conversion of a reciprocating into a rotative motion, and its reconversion into a reciprocating motion in stamping engines; 3rd. The friction, &c. &c. of the cumbrous pumps used in the mines: hence, unless the deficiency in the amount of water pumped up, or error in the computation of the lift, the stamp heads exceeds such friction and resistances. The computed horse-power derived from the duty will be too low. In any inquiry respecting the truth of their claims of improvement, the Cornish engineers do not seem to have urged this point, but they cannot be expected to abandon it in a close comparative inquiry of the performance of rival engines of equal size. I remain, Sir,

Yours' respectfully,

S.

February 7, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

SAMUEL PARKER, OF PICCADILLY, MANUFACTURER, *for improvements in apparatus for preserving and purifying oils, and in apparatus for burning oils, tallow, and gas.* Enrolment Office, March 10, 1841.

1. For the purpose of preserving and purifying oil, the patentee provides a vessel, divided into two compartments, the lower being considerably the largest. A tube descends from the upper compartment to near the bottom of the vessel: above the vessel a funnel is placed, furnished with a tube reaching nearly down to the bottom of the vessel; the vessel has two cocks, one at the bottom, the other close under the partition. The cocks being closed, water is poured into the upper chamber until it rises to the top of its tube: the upper cock is then opened, and through the funnel the remainder of the space in the lower chamber is filled with oil. The upper cock is next closed, and the upper chamber filled with water. The portion of air remaining on the upper surface of the oil is let off by opening the upper cock which is to be again closed, and the oil left to stand for at least twelve hours previous to using.

The apparatus should be left in a warm place, and when the vessel is empty, it should be scalded out with hot water.

2. In order to prevent the wicks of lamps, &c. from charring, the chimney gallery is fixed above the tube that receives the wick, but below the top of the wick; by which means the air is made to strike against the outer surface of the wick, and thus produce the desired effect.

Another mode of accomplishing the same object, is, by supporting a disc of metal, having an opening through it for the passage of the flame, by a wire hoop in the chimney above the tube that contains the wick, but below the top of the wick.

3. In order to regulate the flame, the lower part of the chimney is bell-shaped, so as to cause the air to be conducted against the wick before rising above it. The chimney is provided with a metal top, slit at its lower end and bent outwards so as to be slid up and down the chimney, and held at any required elevation; by which means the extent of the flame can be regulated at pleasure. The metal top may, however, be dispensed with and the flame regulated by raising and lowering the chimney: for this purpose the gallery consists of two rings joined together by short radial bars; the inner ring is affixed to the external tube of the burner by similar bars, and there is an inclined slit in the external tube, through which a pin projecting from the wick tube passes; so that when the gallery is turned, it rises or falls (according to the direction) on the pin in the inclined slit; by which means the height of the chimney and the extent of the flame will be regulated.

4. The upper surface of the lamp, and the under surface of the gallery are ground together to fit as air-tight as possible, so that by simply turning down the gallery and

bringing these surfaces together, the lamp can be extinguished without occasioning any disagreeable smell.

5. The fifth improvement relates to the fountain lamp, patented some years ago by the present patentee: in that arrangement the surplus oil from the burner descended into the second and lowest chambers: in the present instance the overflowing oil is conducted into the lowest chamber but one, (the lamp consisting of four.) Access of air to the flame from the overflow chamber, is prevented by the mouth of the overflow tube being immersed in oil.

6. In chamber lamps the air is admitted all round the wick, by a peculiarly formed tube proceeding from the bottom of the lamp; the chimney is so constructed as to turn the air against the wick in the way already described.

The claim is to, 1. The mode of constructing apparatus for preserving and purifying oil.

2. The mode of preserving the wicks from charring.

3. The mode of constructing the chimney, and the means of applying it for regulating the extent of flame.

4. The mode of arranging the parts of the gallery and the upper part of the lamp, that by bringing them together the lamp will be put out.

5. The mode of constructing fountain lamps, by conveying the overflowing oil into the lowest chamber but one, at the same time preventing access of air to the flame in that direction.

6. The mode of constructing lamps, by causing the air to be conducted against the wick.

Hugh Lee Pattinson, of Bensham-Grove, Durham, manufacturing chemist, *for improvements in the manufacture of white lead.* Enrolment Office, March 10, 1841.

These improvements consist in the application of carbonate of lime to salts of lead, so as to effect their decomposition and a reciprocal exchange of acids and bases. By this chemical reaction, carbonate of lead (white lead) is formed, and a salt of lime remains, depending upon the particular sort of lead made use of. Into a mill (resembling the flint-mills of the potteries) 12 feet in diameter and 3 feet deep, the patentee puts 21 cwt. of chloride of lead, and 7½ cwt. of carbonate of lime (washed chalk or whiting), and fills the tub with water to within 15 inches of its edge. These materials are ground together about 4 or 6 hours, when the tub is filled up with water, and allowed to stand till the next day; there will then be found at the bottom of the tub, a quantity of carbonate of lead mixed with the undecomposed materials, and above it a strong solution of chloride of calcium. This clear liquor is drawn off and the tub refilled with water; the grinding is then renewed, and the materials again allowed to settle: this process being repeated day by day until, at the expiration of seven or fourteen days, the liquor becomes tasteless from no more chloride of calcium being formed; the process is then complete. The carbonate of lead thus obtained is removed from the tub, dried, and packed for sale.

Another mode of making white lead is the following:—a barrel of wood or metal is provided, 4 feet long by 2½ feet diameter, well hooped and bound to resist internal pressure; this barrel is supported on gudgeons and made to revolve by any suitable means. There is a passage through one of the gudgeons into the barrel, furnished with a stopcock and screw, for connecting it with a forcing pump. Through an opening in the side of the barrel the patentee puts 140 lbs. chloride of lead, and 50 lbs. of carbonate of lime, nearly filling the barrel with water. The opening being hermetically closed, carbonic acid gas is driven in by the force-pump to the extent of five or six atmospheres, when the barrel is caused to revolve; reaction immediately ensues, and at the end of four days, the decomposition being nearly completed the materials are allowed to settle. The solution of chloride of calcium being drawn off from the barrel, is replaced with water saturated with carbonic gas, and at the expiration of another day or two the process is complete.

If nitrate of lead is used instead of chloride, and simple water only, 24$\frac{2}{10}$ cwt. of nitrate of lead are added to 7½ cwt. of carbonate of lime. [illegible] the water is saturated with carbonic acid gas, 166 lbs. of nitrate of lead are added to every 50 lbs. of the carbonate.

The claim is to the mode of manufacturing white lead, by means of carbonate of lime, and the chloride or nitrate of lead as herein described.

Edward John Dent, of the Strand, Chronometer Maker, *for certain improvements in clocks and other time-keepers.*—Enrolment Office, March 10, 1841.

The nature of these improvements may be inferred from the following claims:—

1. The right of giving the impulse to the pendulum of a clock at the centre of percussion, or as near as practicable to that centre.

2. The right of producing a compensation for the expansion and contraction of the length of the pendulum, arising from changes of temperature, by causing the arcs of oscillation to vary in an inverse ratio to the vibrations of the length of the pendulum.

3. The right of combining three or more

main springs to act simultaneously, without the medium of a fusee, upon the train of wheels of a chronometer or other time-keeper.

4. The right of placing two intermediate wheels between the three or more barrel wheels, and the centre pinion, in order to make a chronometer or other time-keeper go eight or more days at one winding up.

5. The right of connecting three or more arbors of the main springs with a common arbor, whereby all the barrel arbors may be wound up at the same time by one application of the key.

6. The right of placing a chronometer or other time keeper in an atmosphere of dry non-corrosive gas, contained in an air-tight case, through a stuffing-box in which case the winding-up arbor passes, and in which it revolves, whereby all communication between the contained gas and the external air is prevented.

7. The application of the well known voltaic or electro-metallurgic process to the deposition of a thin film of gold or other metal incorrodible by the atmosphere, upon the steel balance spring and compensation balance, whereby rust is prevented, and consequently one cause of variation in the rate of chronometers is avoided.

Charles Delbruck, of Oxford-street, Gentleman, *for improvements in apparatus for applying combustible gas to the purposes of heat.* Enrolment Office, March 10, 1841.

The first of these improvements refers to the construction of a soldering iron for autogenous soldering, which forms the subject of a previous patent, fully noticed in our 872nd number. The present apparatus consists of a tube with a handle at one end, and a copper bit or soldering iron at the other; within this tube there is another of smaller diameter. Through the exterior tube a current of gas is forced, by connecting it with a suitable gas-holder, while a supply of atmospheric air passes through the inner tube, which terminates a short distance within the gas tube. To heat the copper bit, the gas is turned on and lighted when the admixture of the air will greatly increase the intensity of the heat. The patentee recommends the employment of pure hydrogen where a great heat is wanted, but where economy is an object, carburetted hydrogen (coal gas) may be used.

In consuming gas for producing heat, a chamber is formed, through which a pipe, perforated full of holes passes; gas being admitted into this chamber, burns with a soft dull flame until a supply of air is admitted through the perforated pipe, when the gas is instantly formed into brilliant jets of flame, the combustion is perfected and the heat greatly increased.

An introduction of atmospheric air in a similar manner into the pipes of gas burners is also described, as producing equally satisfactory results.

The claim is to, 1. The mode of constructing an apparatus for joining metals by combining the air and gas tubes, or pipes thereof, one with the other, so as to bring the gas and air together at the point of combustion, when the air passes through the tube as described.

2. The mode of constructing apparatus for consuming gas, when applying it for the purposes of producing heat, by causing a series of jets of air to be propelled amongst, or near a flame of gas.

3. The mode of introducing jets of air into a tube, through which inflammable gas is passing.

Robert Goodacre, of Allesthorpe, Leicester, Gentleman, *for an apparatus for raising heavy loads, in carts, &c., when it is required that the unloading should take place at any considerable elevation above the ground.* Enrolment Office, March 10, 1841.

Four upright beams are connected at bottom by beams and stays, and each pair of beams are connected at top by rollers; two ropes provided with hooks are attached to each of these rollers. At the end of each roller there is a wheel or drum, round which an endless rope is led, from whence it passes round a toothed wheel at the lower part of the machine. On turning this wheel a rotary motion is communicated by the endless rope to the upper rollers, which winds up the ropes suspended therefrom, and any articles to which the hooks have been affixed, for the purpose stated.

George Henry Fourdrinier and Edward Newman Fourdrinier, of Hanley, Stafford, Paper-makers, *for certain improvements in steam-engines for actuating machinery, and in apparatus for propelling ships and other vessels on water.* Rolls Chapel Office, March 17, 1841.

These improvements are, as the title explains, divided into two parts; the improvements in steam-engines consist in applying and working two pistons in one cylinder, which are simultaneously actuated by the expansive force of the same volume of steam. A long cylinder is supported vertically on pivots, in the middle on which it vibrates; two pistons are attached to piston-rods which pass out through stuffing-boxes at either end of the cylinder.

On steam being admitted through suitable slide-valves to the middle of the cylinder, the two pistons are forced apart towards the opposite ends of the cylinder, the valves are then shifted, and the steam admitted at the two ends of the cylinder, which drives the pistons back again to the centre, the spent steam passing off to a condenser or

into the atmosphere, and so on continually. The lower piston-rod is attached to a crank in the middle of the shaft, while the upper piston-rod carries a cross head from which connecting rods pass down to two cranks placed on the same shaft, but opposite to the former, so that as the one is descending the other is ascending, in conformity with the opposite motion of the pistons.

In another arrangement, the cylinder is divided into two parts by a partition in the middle, and the pistons do not expand simultaneously as in the former case, but the one piston begins to move when the other is at the quarter stroke, the valves being so adjusted as to effect this movement, for the purpose of overcoming the dead points, when one piston is at the dead point, the other is exerting its full force.

The apparatus for propelling ships and other vessels, consists of certain arrangements of mechanism by which a volume of air may be forced against the water at the bottom of the vessel, in the direction of its stern, for the purpose of impelling the vessel in an opposite direction. The air being compressed by an air pump, "to the same density as the water under the ship's bottom," is admitted through a valve into a tube, down which it flows into the water. The bottom of the vessel has two guards of wood or other material, parallel to its keel; as the air enters the water beneath the vessel it is guided by the guards, which prevent it from escaping at the sides, and by its pressure against the water, in the direction of the stern, impels the vessel head foremost. The direction of the air, backward or forward, is regulated by a tumbling valve, worked by a quadrant rack or sector, and an endless screw; by altering the position of this valve the direction of the air, and consequently of the vessel may be reversed at pleasure.

When the vessel rolls about in a heavy sea, it is considered desirable to force the air under the most depressed side of the vessel only; to effect which, the air-plugs are connected to a pendulum which opens the valves on the one side or the other, according to the position of the vessel.

In another arrangement for reversing the motion of the vessel, two sets of sliding tubes descend from the air chambers, opening fore and aft; if the vessel is to be propelled head first, the two hinder tubes are depressed and the air passes off towards the stern; but if the vessel is to be backed astern, the foremost tubes are depressed and the air projected towards the head of the vessel.

The claim is, 1. To the application of two pistons working in one cylinder, as shown.

2. For propelling vessels, by forcing a volume of air against the water beneath the bottom of the vessel, in the manner shown and described.

Walter Richardson, of Regent-Street, and George Mott Braithwaite, of Manor-Street, Chelsea, Gentlemen, *for improvements in tinning vessels.* Enrolment Office, March 11, 1841.

These improvements consist in employing an alloy instead of pure tin for the purposes of tinning, which is thus composed:—10 oz. of nickel, 7 oz. of thin sheet iron, and 10 lbs. of tin are melted together, under a flux composed of 1 oz. of borax, and 3 oz. of powdered glass; which produces such a reciprocation of qualities as to produce an alloy much better adapted to the purposes of tinning than anything heretofore employed. It is used in the same way as pure tin has heretofore been employed, and produces a firmer, more adherent, less fusible, and much whiter surface.

Moses Poole, of Lincoln's Inn, Gentleman, *for improvements in preparing materials to facilitate the teaching of writing.* Enrolment Office, March 17, 1841.

These improvements (communicated by a foreigner) consist in the production of printed copies of the letters, by which children are to be taught to write; by the application of Typography. The letters are to be cut on metal plates or blocks, and printed in coloured ink of some paler tint, that will admit of being passed over with a pen dipped in common ink. Stress is laid upon the necessity of the characters being of the most perfect and uniform description; and several modes of making printing-inks for this purpose are set forth. By tracing over the copies thus produced, children are to be taught to write, instead of by merely imitating the copies as heretofore.

Thomas Robinson Williams, of Cheapside, Gentleman, *for improvements in the manufacture of woollen fabrics, or fabrics of which wools, furs, or hairs, are the principal components, as well as for the machinery used therein.* Rolls Chapel Office, March 18, 1841.

These improvements relate chiefly to the making of cloth by felting alone, without spinning and weaving, and consist in a new combination of machinery, apparatus and processes, in order to obtain first a long, even and uniform bat of wool, or other materials of any required length, width or thickness, suitable to be made into commercial ends or pieces of cloth; and afterwards for the purpose of producing such fabrics, or ends, or pieces of cloth composed of all the various well-known felting substances, such as wools, furs, and hairs of animals—and which are to be used either separately, or mixed up together in every possible proportion, and sometimes with a small addition of non-felting fibrous materials, such as cotton, silk, or flax, but not exceeding ⅓, as best suits the description of fabric required.

The fabric or manufacture as produced by the patentee's processes and machinery, are stated to depend wholly for their union and strength upon the great principle or tendency of these animal substances, when properly treated to combine and unite, or as it is commonly called, to felt together; and this without the usual auxiliaries of spinning and weaving, or the use of any adhesive mixture being employed.

In the manufacture of felted cloth the patentee dispenses with the use of any oil or oleaginous matter, and prefers that the wool should be well scoured and dried, after which it should be teazed or willied, picked, and scribbled in the usual way. The dry, clean wool, as thus prepared, is weighed out into quantities for producing any required thickness; it is then taken to the common wool-carding engine, which should be from 72 to 84 inches broad, furnished with two long revolving aprons of linen cloth, passing over rollers which have a motion from the doffers of the card, or other convenient part of the engine. The two aprons and drums revolve in opposite directions, so that their two inner surfaces move in the same direction with a uniform speed. The wool is taken off from the doffers, by the usual comb-crank motion, in an attenuated sliver, which is received between the two aprons and travels on to their farther end, when it is wound one sliver over the other till the bat has become of sufficient thicknes. When the manufactory is not of sufficient length for the aprons to work horizontally, they may be wound backward and forward, or perpendicularly upward and downward. For finer and lighter goods, the bat is produced from successive folds of sliver; but taken off from the doffers of different carding engines, and received simultaneously upon the same aprons.

It is necessary to keep the aprons from wrinkling, and carefully and uniformly extended: for this purpose, cords or strips of leather are sewed along the edges of the aprons, with which longitudinal guides, or friction rollers are brought in contact. The continuous bat having been received upon a proper roller, is taken to the hardening machine, which consists of two series of rollers, one above the other, wrapped round with an elastic cloth; the lower set are furnished with a traversing apron. Heaters and perforated steam-pipes extend from side to side of the apron, which allow steam to escape for moistening and warming the bat of wool, a condition essential to the first stage of the felting process, called hardening. In lieu of the steam-pipes, a greater number of heaters and a sprinkling apparatus may be used. The upper tier of rollers have an alternating motion, end-ways, given to them by a cranked shaft running along the side of the machine. The hardening rollers also receive a slow progressive motion from the main shaft.

By means of the alternating motion of the upper rollers as the bat passes slowly through them, acting against the resistance of the lower rollers which do not alternate, and aided by the moisture and heat, the bat reaches the end of the machine in a consolidated firm state, possessing a considerable degree of feltation. The bat is next transferred to what the patentee calls an improved felting-machine: it consists of a frame supporting a double tier of rollers, the upper tier resting between the lower one so as to increase the surface in contact. The undulating, and backward and forward motion produced on the bat in this machine by the new position of the rollers, materially assists the felting process. The rollers are actuated by bevil gear upon alternate ends of the upper tier of rollers, which turn the lower ones by spur wheels upon their opposite ends, connected with similar gear upon two shafts extending the whole length on each side of the machine. The upper rollers are weighted so as to give a uniform pressure to materials differing in thickness. The lower rollers are more or less immersed in a leaden cistern, containing hot water or soap suds; acids or acidulated water, heretofore used for this purpose, being considered by this patentee greatly inferior to saponaceous mixtures. In order that the cloth may be subjected to the felting action in as many directions as possible, it is transferred to another machine where the rollers are placed at an angle of about 45° with the feeding apron. After leaving this machine the cloth may be milled in a common clothier's fulling mill, and again passed through this machine. The cloth may be finished by the usual processes of raising, shearing or cropping, boiling, pressing, &c. But a new raising machine, which is preferred, is described.

The claim is, to the application of a double apron or aprons, or compound aprons and rollers or cylinders, for the production of bats in a smooth and even condition; and the extended sliver itself, as herein described, applied to forming a bat by successive folds or layers for the production of long or continuous ends of cloth without spinning or weaving. Also to the improvement of the hardening machine, by using the heaters in addition to steam pipes or pans, or in conjunction with a wetted apron; and using travelling aprons. Also to the improved positions of the rollers in the felting machine for producing the double contact of each tier of rollers; and the combined, reciprocating, and progressive motion of the rollers, as well as the manner in which this motion is

produced and applied to the said felting machine; and also the method of diagonal or cross felting, as effected by the diagonal felting rollers; and also the method described of producing long continuous fibres of felt in a fit state for the common fulling stocks.

Mr. W. claims farther the raising machine, and the diagonal position of the raising cylinders, and particularly also the use of other or oppposite revolving cylinders, whether covered with cards, or any other material for clearing raising cylinders whilst at work, as applied to the cloth manufactured by felting alone, or by the old method of spinning or weaving. Also the use of soap, or saponaceous matters dissolved in water, in conjunction with rollers for assisting in the felting of fabrics made without spinning and weaving, in contradistinction to acids or acidulated water which have heretofore been used, for fabrics depending for their union upon felting alone.

John Maughan, of Connaught-terrace, Edgeware-road, Gentleman, *for certain improvements in the construction of wheeled carriages.* — Rolls Chapel Office, March 20, 1841.

The wheeled carriages herein referred to are curricles; whether the improvements introduced by this patentee will restore this obsolete form of vehicle to public favour, remains to be seen; we greatly doubt such a result.

In lieu of the pole and cross-bar, two pair of shafts are employed for attaching the two horses, by which means a much lighter construction of vehicle is practicable—elegance of appearance increased—more freedom of action allowed the horses in their draught—and greater safety ensured. Each pair of shafts, which are constructed of ash, ironed in the usual way throughout, are connected together by a horizontal bar, the middle of which is cylindrical, and held by clips, in which the bar turns freely, as on an axle. The clips are connected to the body of the carriage by an upright pin extending therefrom and passed through a socket in the scroll or bracket iron. The horizontal bars are attached to the shafts by clips at their extremities, beyond which the back part of the shafts are bent inwards, or "compassed," and terminate in a socket with a bolt eye.

Under the seat of the body of the vehicle, a horizontal balance spring is placed transversely, mounted on a strong stud or short axle affixed to the framing of the body, the outer end of which axle is supported by a pendant bolt. A loop or bored coupling connects the spring to the stud or axle, and allows it to vibrate and advance, or recede thereon. From the ends of this spring, two rods are pendant, for the purpose of connecting the spring to the ends of the shafts.

Let it be supposed, says the patentee, that two horses are attached to this curricle, the belly-bands of the harness being passed round the shafts at the tugs, and the traces hooked on to the extremity of the swing-trees in the ordinary way; it will be seen from the manner in which both pair of shafts are connected to the balance spring, and the peculiar method of attaching the shafts to the carriage by the joints formed by the clips and the upright pin, that the action of one horse, however different from that of the other, will not incommode its companion, or communicate any unpleasant motion to the carriage. As the bars of the shafts turn vertically in the clips, and the upright pin of the said clip turns horizontally in the socket of the scroll iron, a sort of shackle joint is thereby produced, which admits of the desired balance and horizontal action of the shafts, provided for by the balance spring and connecting rods.

Shields and cross plates, for preventing one shaft catching under the other, and also pads to prevent chafing of the harness are described at length.

George Goodman, of Henley-in-Arden, and of Birmingham, Needle Manufacturer, *for certain improvements in the manufacture of mourning and other dress pins.* Enrolment Office, March 22, 1841.

This patent refers, in the first place, to making mourning or other dress pins of iron, common steel, or cast-steel wire, so that they shall be harder and more elastic than those of the ordinary kind, and susceptible of a much finer point; 2dly. To making common dress pins of iron, common steel, or cast-steel wire, and making their heads of silver, copper, brass, or other metallic alloy which has been plated or covered with silver.

Wire of a proper size is cut into pieces long enough to make two pins; a quantity of these wires are formed into a bundle by placing their ends in two iron rings four inches in diameter, and about half an inch wide. In this state they undergo the usual softening process, after which they are straightened by the process known amongst the needle makers as "rubbing." The wires are then pointed at each end by what needle makers term "dry pointing."

If iron wire has been employed, it is now hardened or converted into steel by cementation with bone dust, &c., in the usual manner, after which the wires are divided, and completed by heading, tempering, and blueing, or blacking. The pins are headed while soft, in a pin heading machine in the usual way, and then hardened by heating them red hot in iron trays, and dropping them into water having a small quantity of oil on its surface. They are afterwards tempered, and then scoured by agitation in a vessel with

soap leys, and sand or emery, and afterwards blued or blacked in the ordinary manner. Or the stems are "nicked" for the heads, and then hardened and tempered; after being picked, and the crooked ones straightened, they are submitted to the process called by needle makers scouring; the stems are laid down many tiers deep on a cloth with oil, soap, and flour emery; the cloth is rolled up and tied, and subjected to the operation of a machine resembling a mangle for several days, the emery, &c., being frequently renewed, and the stems washed each time. The stems are then "glazed" with putty of tin and olive oil, after which they are headed, (the heads being previously scoured), blued, and finished.

The claim is; 1st. To the application of the process of "rubbing," and "dry pointing" to the manufacture of pins; 2nd. To the process of hardening and tempering as applied to the manufacture of pins; 3rd. The use of heads of silver, or any other metal or metallic alloy previously plated or covered with silver to stems of tempered steel in the manufacture of pins; 4th. To the scouring and glazing the stems of pins as herein described, and the scouring of the heads before being fixed on the pins.

LIST OF DESIGNS, REGISTERED BETWEEN FEBRUARY 25TH AND MARCH 25TH.

Date of Registration. 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Feb. 25	621	H. Brinton	Carpet	1 years.
26	622	S. Ackroyd	Fender	3
"	623	W. Peirce	Candle lamp	3
March 4	624	T. Brown	Ribbon	1
"	625,6	H. I. and J. Dixon	Carpet	1
5	627	D. Morison	Ornament for book backs	1
"	628	G. Walton	Gig saddle	1
"	629	R. Armstrong	Sediment collector for boilers	3
8	630	Sandford, Son and Owen	Kitchen range	3
10	631,2	Lea and Co.	Carpet	1
"	633	W. Ponsford	Envelope	1
11	634	Mrs. I. Larbalestier	Pelisse	1
12	635	I. Yates	Stove	3
"	636,7	Morton and Co.	Carpet	1
15	638,640	Elcock and Jones	Ditto	1
"	641	H. Brinton	Ditto	1
18	642	Henderson and Co.	Ditto	1
"	643	Wilkins and Son	Percussion cap charger	3
23	644	H. I. and J. Dixon	Carpet	1
25	645	I. Sheldon	Label	1
"	646	I. Smeeton	Spring for waistcoats, trowsers, &c.	1

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 23RD FEBRUARY, AND THE 22ND MARCH, 1841.

George England, of Westbury, Wiltshire, clothier, for improvements in machinery for weaving woollen and other fabrics, and for twisting, spooling, and warping woollens, also for improvements in the manufacture of woollen doeskins. March 2; six months to specify.

John Wilkie, Nassau-street, Mary-le-bone, upholsterer, and John Charles Schevitse, of George-street, Saint Pancras, musical instrument maker, for improvements in constructing elastic seats or surfaces of furniture. March 2; six months.

Henry Newson Brewer, of Jamaica Row, Bermondsey, mast and block maker, for an improvement or improvements in wooden blocks for ships, rigging, tackles and other purposes, where pullies are used. March 3; six months.

John Rand, of Howland-street, gent., for certain improvements in machinery for the manufacture of frame work knitting or hosiery. March 6; six months.

Thomas Spencer, of Liverpool, carver and gilder, for an improvement, or improvements in the manufacture of picture and other frames, and cornices applicable also to other useful and decorative purposes. March 8; six months.

John Varley, of Bayswater Terrace, Bayswater, artist, for an improvement in carriages. March 8; six months.

John William Neale, of William-street, Kennington, engineer, and Jacque Edouard Duyck, of Swan-street, Old Kent Road, commission agent, for certain improvements in the manufacture of vinegar, and in the apparatus employed therein. March 8; six months.

Benjamin Smith, of Stoke Prior, near Bromsgrove butcher, for an improved apparatus for making salt from brine. March 8; six months.

John Walker, of Crooked-lane, King William-street, for an improved hydraulic apparatus. March 8; six months.

Richard Lawrence, Sturtevant, of Church-street, Bethnal Green, soap manufacturer, for certain improvements in the manufacture of soap. March 8; six months.

Thomas Joseph Ditchburn, of Orchard House, Blackwall, shipbuilder, for certain improvements in ship building, some, or all of which, are applicable to steam boats, and boats, and vessels of all descriptions. March 8; six months.

Anthony Todd Thomson, of Hind-street, Manchester-square, doctor of medicine, for an improved method of manufacturing calomel and corrosive sublimate. March 8; six months.

Stephen Goldner, of West-street, Finsbury Cir-

cus, merchant, for improvements in preserving animal and vegetable substances and liquids. March 8; six months.

John Wertheimer, of West-street, Finsbury Circus, printer, for improvements in preserving animal and vegetable substances and liquids. (A communication.) March 8; six months.

Thomas Clark, professor of chemistry, in Marischal College, Aberdeen, for a new mode of rendering certain waters (the water of the Thames being among the number,) less impure and less hard for the supply and use of manufactories, villages, towns, and cities. March 8; six months.

John Baptist Fried Wilhelm Heimann, of Ludgate Hill, merchant, for improvements in the manufacture of ropes and cables. (A communication.) March 8; six months.

John Dockree, of Galway-street, Saint Luke's, gas fitter, for an improvement, or improvements on gas burners. March 15; two months.

Ricard Laming, of Gower-street, Bedford-square, surgeon, for improvements in the production of carbonate of ammonia. March 15; six months.

William Newton, of Chancery-lane, civil engineer, for certain improvements in machinery or apparatus for picking and cleaning cotton and wool. (A communication.) March 15, six months.

Robert Warington, of South Lambeth, Surrey, gent., for improvements in the operations of tanning. March 16, six months.

Joseph Maudslay, of Lambeth, Surrey, engineer, for an improvement in the arrangement and combination of certain parts of steam engines, to be used for steam navigation. March 16; six months.

William Newton, of Chancery-lane, civil engineer, for improvements in spinning and twisting cotton, and other materials capable of being spun and twisted. (A communication.) March 16; six months.

George Lowe, of Finsbury Circus, engineer to the chartered gas company, for improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating power. March 16; six months.

Charles Bunt Dyer, of Pary's Mine, Anglesea, mine agent, for an improved method of obtaining paints or pigments by the combination of mineral solutions and other substances. March 16; six months.

Laurence Kortright, of Oak Hall, East Ham, Essex, Esq., for certain improvements in treating and preparing the substance commonly called, "White Bone," and the fins and such like other parts of whales, and rendering the same fit for various commercial and useful purposes." (A communication.) March 17; six months.

William Thompson Clough, of Saint Helens, Lancaster, alkali manufacturer, for improvements in the manufacture of the carbonates of soda and potash. (A communication.) March 17; six months.

Henry Augustus Wells, of Regent-street, gent., for improvements in machinery for driving piles. (A communication.) March 17; six months.

Joshua Field, of Lambeth, engineer, for an improved mode of effecting the operation of connecting, and disconnecting, from steam engines, the paddle wheels, used for steam navigation. March 22; six months.

Richard Barnes, of Wigan, Lancaster, engineer, for certain improvements in machinery, or apparatus for raising or drawing water or other fluids. March 22; six months.

Anthony Theophilus Merry, of Birmingham, refiner of metals, for an improved process, or processes for obtaining zinc and lead from their respective ores, and for the calcination of other metallic bodies. March 22; six months.

Robert Walter Winfield, of Birmingham, merchant and manufacturer, for certain improvements in, or belonging to metallic bedsteads, a portion of which may be applied to other articles of metallic furniture. March 22; six months.

Robert Goodacre, of Ullesthorpe, Leicestershire, for an improved mode of weighing bodies raised by cranes or other elevating machines. March 22; six months.

David Napier, of Mill Wall, engineer, for improvements in propelling vessels. March 22; six months.

Achille Elie Joseph Sovitas, of George Yard, Lombard-street, merchant, for improvements in apparatus for regulating the flow of fluids. (A communication.) March 22; six months.

William Bucknell, of Westminster, gent., for improvements in applying heat for the purpose of hatching eggs, which improvements are also applicable to other useful purposes where heat is required. March 22; six months.

Morris West Ruthven, of Rotherham, engineer, for a new mode of increasing the power of certain media, when acted upon by rotary fans or other similar apparatus. March 22; six months.

Robert Cook and Andrew Cunningham, of Johnstone, near Glasgow, engineer, for improvements in the manufacture of bricks. March 22; six months.

Moses Poole, of Lincoln's Inn, gent., for improvements in stretching cloths. (A communication.) March 22; six months.

Joseph Wright, of Carisbrook Isle of Wight, mechanic, for improvements in apparatus used for dragging or skidding wheels of wheeled carriages. March 22; six months.

Thomas Wright of Church Lane, Chelsea, Lieutenant in Her Majesty's Navy, for certain improvements applicable to railway and other carriages. March 22; six months.

Edward Finch, of Liverpool, ironmaster, for improvements in propelling vessels. March 25; six months.

Goldsworthy Gurney, of Bude, Cornwall, Esq., for improvements in the production and diffusion of light. March 25; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 23RD FEBRUARY, AND THE 22ND MARCH, 1841.

William Orme, of Stourbridge, Worcester, iron master, for improvements in the manufacture of cofered spades and other cofered tools. Feb. 23.

William Pierce, of Islington, Middlesex, gentleman, for certain improvements in the preparation of wool and other animal fibres, both in the raw and manufactured state, by means of which the quality will be considerably improved. Feb. 24.

Theophilus Richards, of Birmingham, Warwick, merchant, for improvements in cutting or sawing wood. (A communication from abroad.) Feb. 26.

Francis Sleddon, junior, of Preston, Lancaster, machine maker, for certain improvements in machinery, or apparatus for roving, slubbing, and spinning cotton, and other fibrous substances. March 2.

Hugh Lee Pattinson, of Bensham Grove, near Gateshead, Durham, manufacturing chemist, for improvements in the manufacture of white lead. March 3.

Charles Cameron, esq., lately captain in her Majesty's 18th regiment of foot, and presently residing at Mount Vernon, Edinburgh, for certain improvements in engines to be actuated by steam or other elastic fluids. March 3.

Paul Hannuic, of Paris, but now of Manchester, Lancaster, solicitor, for certain improvements in the construction of governors or regulators applicable to steam-engines, and to other engines used for obtaining motive power. (A communication from abroad.) March 3.

Charles de Bergue, of Sydenham, Kent, gent., for certain improvements in machinery for making reeds used in weaving. (A communication from abroad.) March 3.

William King Westly, of Leeds, York, flax machinist, for certain improvements in carding, combing, straightening, cleaning, and preparing for

ing, hemp, flax, and other fibrous substances. March 6.

Robert Urwin, of South Shields, Durham, engineer, for certain improvements in steam-engines. March 9.

Walter Richardson, of Regent-street, Middlesex, and George Mott Braithwaite, of Chelsea, also Middlesex, gent., for improvements in tinning metals. (A communication from abroad.) March 11.

John Rand, of Howland-street, Middlesex, gentleman, for improvements in preserving paints and other fluids. March 16.

Thomas William Booker of Melin, Griffith Works, near Cardiff, iron master, for improvements in the manufacture of iron. March 16.

Charles Edwards Amos of Great Guildford-street, in the Borough of Southwark, for certain improvements in machinery or apparatus used in the manufacture of paper. March 18.

William Hancock, junior, of King-square, Goswell-road, Middlesex, accountant, for an improved description of fabrick suitable for making friction-gloves, horse brushes, and other articles requiring rough surfaces, and the method of manufacturing the same. March 19.

Frederick Steiner of Hyndburn Cottage, near Accrington, Lancaster, Turkey-red dyer, being a communication from abroad, for improvements in looms for weaving, and cutting asunder double [piled] cloths, and a machine for winding weft to be used therein. March 19.

Matthew Uzielli of King William-street, London, merchant, being a communication from abroad, for improvements in impregnating and preserving wood and timber for various useful purposes. March 22.

NOTES AND NOTICES.

Bennett's Filter.—We are requested to inform our enquiring friend, H. S., (page 128,) that Mr. J. Burgess, of Wisbeach, an agent for the sale of Bennett's Filter, and can supply them in either lead or zinc, which are not so liable to be broken as those in earthenwere.

New Kind of Pistol.—We have been shown, by A. W. Spies, of this city, a pistol of a very ingenious construction, which he calls "the self-cocking and revolving pistol." It consists of six barrels disposed in a circle, which may be discharged successively, by merely pulling the trigger. The machinery, which is exceedingly simple, is so constructed that no cocking with the hand is necessary. The sample which we saw was a boarding pistol intended for the use of the navy. The seaman in boarding a vessel with one of these weapons, might, while hanging to the rigging with one hand, discharge with the other hand the barrels one after another, taking deliberate aim at the enemy. It strikes us as a great advantage to the naval service, to leave one hand free for other uses, while one is employed in managing the weapon.—*New York Paper.*

Steel Ore—A New Discovery.—The *National Intelligencer* says, that in the town of Duane, in Franklin county, a vein of magnetic oxide has been discovered, which, on smelting, yields a substance possessing all the physical and chemical properties of manufactured steel. The same paper adds—"However little the world may be prepared to give evidence to the existence of such a mineral in the state of an oxide, the fact is now too well established to admit of scepticism, and no one who will examine the edge-tools and cutlery of all kinds that have, during the past season, been cast from this mineral and sent out into most of the cities for samples can do so great violence to his own senses as to doubt any longer the existence of a "natural steel," from which, by the simple mode of moulding and casting, razorblades penknives, shears, plane irons, gouges, axes of all sizes and descriptions, and every variety of tools of the machinist and carpenter's shop, are at once produced, having all the properties and best qualities of the purest steel."

The Prince Albert Plough—An Improved Drain Plough.—On Tuesday last, Mr. Ebenezer Alexander farmer at Taylorton, tenant upon one of the town's farms, invited the town council, and a number of other friends, chiefly connected with the agricultural interest, to see his operations with the above plough, which is one of his own and his brother's invention. Our readers are generally aware that thorough draining has now become a part of the routine labour upon every farm, and as it is both an expensive operation, and one which consumes a great deal of time when performed in the ordinary manner of employing men at so much the chain, various plans have been devised to shorten the time, which, in our valuable climate, can very ill be spared. Among other plans, the drain plough of Mr. M'Ewan, of Blackdub, holds a distinguished place, and seems to have laid the foundation for the improvement we saw at work on Tuesday last. The deficiency of Mr. M'Ewan's plough, to be obviated is, that after it has gone over the field and scooped out the subsoil, a man has still to follow and take out of the bottom of the drain, part of the soil with a spade, while the cleaner again follows him. Mr. Alexander's plough, on the contrary, completes this process at once, leaving nothing for the spade to do, and very little for the cleaner. The distinguishing features of this plough consist in the form given to the sock, and the prolongation of the mould or reast. The sock has attached to it, upon the right hand side, what is called a feather, which is a piece of iron somewhat in the shape of a short coulter. This inclines backward at an angle of fully 45 degrees, and when it is fixed to the sock it measures 4½ inches from the body of the plough, while at the top it measures 7½, both inside measure, and it cuts to the depth of 13 inches. The drain, when cut, measures fully five inches at the bottom, and eight at the top. The labourers now follow, laying in the tiles, after which the drain is filled up, and the work is completed in a very expeditious manner. The elongation of the mould or reast serves the purpose of throwing the unproductive subsoil quite clear of the productive upper soil, so that it can be easily cast back into the drain in its proper place. The elongation is about two feet. The mode of working this plough is by twice going over the field, for it is so constructed, that by fixing different socks, which Mr. A. has, it will work either shallow or deep, so that if it were required he may even go over the field a third time, deepening the cut at each turn. When we saw it working it was drawn by eight horses, but when it goes the first time it is generally drawn by four, and sometimes by six horses. As proof of the facility with which it does its work, we may mention, that on Saturday last, the draining of four Scotch acres, at the rate of a drain in each alternate furrow, was fully completed in about four hours. The great object Mr. Alexander has in view is not so much the saving of expense as of time, besides giving certainty to his operation, and these objects we think he has accomplished in a very satisfactory manner. It is only proper to add, that every one, whether practical farmers or amateurs, expressed themselves highly pleased with the working of the plough, declaring it to be superior to anything they had hitherto seen.—*Stirling Observer.*

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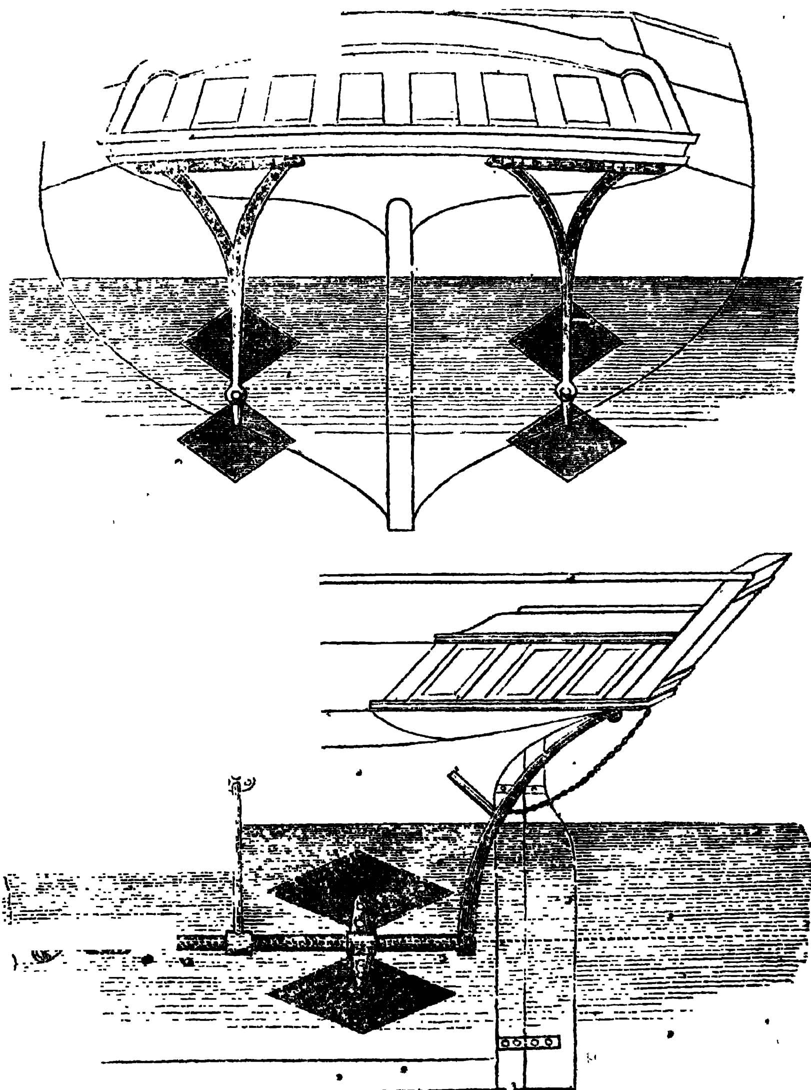
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 921.] SATURDAY, APRIL 3, 1841. [Price 6d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

CAPTAIN CARPENTER'S PATENT QUARTER PROPELLERS.



CAPTAIN CARPENTER'S PATENT QUARTER PROPELLERS.

Sir, — Herewith I send you two drawings of my Patent Propeller for your Journal, and with it one of the prospectuses printed for circulation last year. In this prospectus, divested as it is of scientific terms, and fitted for the generality of readers, you will find embodied the heads of the merits of my patent. In the point of application of my "*vis motrix*," I have always viewed, united to the form of the propellers, its superior advantage. Whenever the term propeller occurs, you will see the epithet "quarter" in italics, and in the strictures and elucidations you may be pleased to offer on my invention, will you have the goodness to request your printer to follow the same rule?

Adverting to No. 919 of your journal, and to the results of the experiments therein mentioned, I feel assured, that when the time arrives for these "quarter propellers" being used on a large scale, and put in motion by the "constant and maintaining power of steam," the results as to speed, &c., will prove the same as in the comparative trials of the small working models.

I hope soon to be able to furnish you with all my experiments on submarine propellers; but at present I must beg of you to be content with the following:—

"The first experiments (on any thing like a large scale) was on board the *Aerolite*, a vessel 69 feet long, and 9 feet beam. They were intended only to ascertain how far the apparatus was adapted to sailing vessels, for the purpose of moving them about in calms, or as an auxiliary to the wind and sails. The powerful effect produced by the rotation of these 'quarter propellers,' even by manual power, was enough to establish the fact, that any vessel, however large, may be moved in an opposite direction to that line in which the force is applied, quicker or slower, according to the extent of the motive power.

"The next experiments were made with a model of a steam-boat, which is now exhibited at the Polytechnic Institution. This model is supplied with the means of applying a great variation of power to the propellers, and it admits also of great variation in the shape of the propellers, by which means I have had an opportunity of judging upon the merits of screws, sections of screws, and planes; and of testing the angle of incidence, the shape of the vane or blade, and the relative proportions they should bear one to the other, according to the power applied. Although a screw is decidedly a powerful instrument in the water, I must nevertheless give the preference to the plane and to the figure shown in the accompanying drawing, because it produces the greatest speed with the least sacrifice of power, more especially when the vanes are set at the angle of 30° or 35° to the axis of the shaft. And here I would remark, and I hope without presumption, that if any merit may be attached to this part of my invention, it consists in the discovery by careful experiment, that a plane having the proportions of my propeller, as represented in the drawing, will, when set at the above angles, and revolving in the water, impell a vessel by means of a locomotive power, and the resistance offered by the fluid, with a greater effect than any other instrument yet adopted in navigation, which may be proved by mathematical demonstration.

"The next experiment was made in a boat 21 feet long, and 4 feet, 8 inches wide It is necessary here to remark, that only one propeller was used, and that was placed in the stern. The object of which was, to test the shape of the triangular propeller against the screw, and other propellers with the same power, the same position, and the same machinery; but it is so difficult to make every thing bear in an equal proportion, that I doubt whether the experiments can be considered conclusive. I do not apprehend there would be so great a difference as 3 to 6 between Mr. Rennie's propeller, Mr. Smith's screw, and my triangular propeller, as stated in your journal, if the experiments could be made equal in every respect, but that is impossible. Mr. Rennie's experiments, I believe, were made in a heavier boat than the one I used; and although there may not be much difference in the area of the midship section, still as there might have been a difference in the strength of the men and other circumstances, I

do not think a comparison could be established; I therefore only presume to give you for data this fact, that with the very same propeller as I now send you, the boat was propelled with two men turning the winch, 88 measured yards in 33 seconds, and sometimes in timing it, it appeared to be 30 seconds—the propeller making 119.5 revolutions in that time."

I remain, sir, yours', &c.
EDWARD CARPENTER.
London, March 28, 1841.

Sub-marine Propellers.

At the period when the build and internal arrangement of ships appeared to have attained perfection, the adaptation of a new impelling power—STEAM, gave to man the mastery over winds, and waves, and tides.

It was taken for granted, when the "steam-engine" first assumed "locomotion," that the power must be adapted to the vessel, not the vessel to the power, and the huge and ponderous paddle-wheel—the old undershot but reversed water-wheel—bristled forth on either side.

Disfigurement—loss of power from the nature of their action, and still more from the site where the motive wheels are placed—inconvenience and danger from the turmoil of waters in river navigation—destructive to canals—unfit auxiliaries to sailing vessels—peril from the position of the engine, its furnace and boiler in the very heart of the vessel—extreme exposure of paddles to injury from the missiles of an enemy,—all combine loudly to proclaim the disproportion of the result to the means, and the "*error loci*" selected for their agency.

From the first essays of Fulton to within the last few years, all inquiry seems to have lain dormant as to what "*instrument*" was best calculated to produce the greatest speed attainable, with reference to the specific gravity of the fluid in which the vessel floats, and what position the power should assume to produce the greatest possible advantage.

It is seldom we find that the genius of man steers the direct course of nature, although daily experience has taught him to believe her to be, the most faithful guide to perfection. There is a tribe of birds whose whole existence is confined to the ocean. Their boat-like form of body, short limbs, scale-like plumage, concurring to fit them for dwelling entirely on the water. In this tribe the feet progressively retrograde from the centre of the body, until in the Auk or King Penguin, they are placed so remote that in the act of walking on land, the position of the body is nearly perpendicular. As their feet recede in these aquatic birds, so decreases the power of flight from imperfection of wings, but at the same time increases their celerity of progression on the surface of the ocean. When in the lower class of these birds flight becomes quite impossible, and locomotion on shore nearly so, then the extreme remoteness of the legs imparts to this bird in swimming, a velocity which *steam* has yet to attain. Here stands forth the model for imitation, formed by the unerring hand of Nature, and subservient to this prototype must all the arrangements, both external and internal of the steam-vessel eventually bow.

The propelling agents located astern will effectually impart all their power, and there united with furnace, boiler and working gear, emulate to a certain extent the railway locomotive engine. Thus remote, thus almost disjunct and separated by the ingenuity of the ship-builder from the greater portion of the vessel, the engine will no longer expose human life to the present fearful chances of escape from explosion and conflagration. Constantly immersed in the fluid through which the ship is to be propelled, the motive force like the webbed feet of the bird, under the "*quarters*," free of the disturbed water directly aft, will impart its full power. Engines of less weight and expense, less consumption of fuel, gear less ponderous less bulky, will follow as necessary consequences, and the steam-vessel thus equipped will be improved for commercial purposes and rendered efficient as a vessel of war.

A screw propeller placed in the dead-wood of the *Archimedes* Yacht, has, it would appear from the public papers, fully established equality of speed with the common paddle-wheel. This propeller differs in *form* and *position* from the "*quarter*" propellers to which this paper immediately appertains, but the *principle* is the same; and on the ocean

it establishes that main that principal fact, which the small model in the Polytechnic Institution under all its disadvantages also fully bears out—"*equality of speed*," even in these early and imperfect essays. In the "*quarter*" propellers applied to this model will be found, a more direct and faithful adherence to nature's prototype, and in their rapid rotatory action in the water, under the most favourable angle of incidence the blades display, the combined powers of wedge and screw. No back-water ruffles their silent course. A gentle undulatory ripple marks the tract described by each propeller, similar almost to that which follows the action of the tail of a fish when swimming rapidly near the water's surface. The same obedience to the helm with equal facility of backing astern may also be observed, and in case of accident to the rudder, the power of steering is practicable by their alternate and combined actions.

This propeller (for which Her Majesty's Royal Letters Patent have been obtained)* has stood the test of a series of experiments on a vessel sixty-nine feet in length. Its shape was selected from a number of geometrical figures, all of which were experimented upon at a considerable expense, during two years of unceasing application to the subject, and its position, the "*quarter*," which in naval architecture, forms that section of a vessel immediately before the boundary of the stern has been chosen for its practical advantages.

The engravings on our front page, represent a side elevation, and stern view of a vessel fitted with the quarter propellers.

These Patent Submarine propellers are adapted to Sailing Ships, Canal Boats or Steam Vessels generally. Sailing Ships can use them as auxiliaries in Calms or whenever it may be desirable to quicken their speed. Canal Boats can be propelled at an increased speed without injury to the embankments and with economy as compared with tracking. Steam Vessels generally can use them instead of the Common paddle wheel with equality of speed, additional safety, economy and comfort.

N. B. The action of these Propellers in the water is rotatory, uniting the principle of wedge and screw. The efficacy of the principle was first tried on a Model of a Brig of War in the early part of 1838—vide *Times* and *Hampshire Telegraph*, September, 1838, and afterwards on board the experimental Steam Yacht, *Euclid*, 69 feet in length, with great success on the River Thames in the year 1839.

* Vide abstract of Captain Carpenter's specification at page 606 of our last volume. Ed. M. M.

NEW THEORY OF THE UNIVERSE—FIRMAMENTAL AND OTHER FLUIDS.

Sir,—The clear explanations on various subjects by your enlightened correspondents, affords me so much facility in setting forth my theory, that I do not like to suffer any opportunity of availing myself of such an advantage to escape. An article of this description, signed "A. Peacock," (No. 918), asserts that "matter is found to exist under three distinct modifications or forms, viz. the solid (concrete), the fluid, and aeriform (gaseous)." For want of a better nomenclature I have arranged matter thus—solid and fluid, the latter being subdivided into aquarial, firmamental, gaseous, and igneous. The same standing in their order of weight. The firmamental fluid being the neutral fluid between the aquarial and igneous fluids. As no igneous gas can return on its own path, when it meets with a gas of the same description, the two must either have room to pass, undergo a chemical change by their union, or explode; unless, indeed, they should both be free, alike from their own sources and from foreign compulsion. Under this consideration is it surprising that a very slight variation in the state of the material, should render it a conductor or non-conductor of electricity; or the power of fulminating gases be great. In an extract from the *Athenæum* in your 918th No., on sulphurated hydrogen gas, is the following:—"It has been experimentally found, that so small a mixture as a fifteen hundredth part of sulphurated hydrogen in the atmosphere, acts as a direct poison on small animals," &c. Without my theory what would become of all the noxious gases which are continually rising from the earth and its surface? Without the opposition of these noxious gases to the solar and firmamental fluids, what power would forward the world on its course? How interesting is this speculation. Nothing is in vain in the works of the Almighty—

"E'en partial evil's universal good."

I remain, Sir,

Your obliged servant,

E. A. M.

ON THE CONSTRUCTION OF VELOCIPEDES.

Sir,—I am desirous of offering some observations respecting velocipedes in reply to your correspondent "Evander," if the subject should appear of sufficient importance to deserve a place in your columns.

The first velocipedes were introduced into this country from France upwards of twenty years ago, and the novelty of the machine excited a great degree of public attention at the time. The novelty soon passed away and their use excited so much ridicule, that they were speedily laid aside. This velocipede consisted of 2 wheels about 2½ or 3 feet diameter, connected by a pole, one wheel being in front and the other behind. The rider sat on a seat across the pole and propelled himself by striking the ground alternately with his feet. The appearance of a man striding across a pole, it must be confessed, somewhat justified the ridicule which these machines ultimately excited.

A second velocipede was introduced soon afterwards, invented by Mr. Sievier, which was of far superior construction and appearance. It consisted of two wheels of about 5 or 6 feet diameter, between which the rider balanced himself on a seat; it was propelled in the same manner as the former, and was constructed with a degree of lightness scarcely to have been expected. The public being tired of the matter, this machine was very little known and has probably been forgotten.

Various kinds of velocipedes have from time to time been presented to public notice, almost all of which have been constructed with an utter disregard of the most simple mechanical principles. Most of them have been propelled by turning a winch with the hand, and thus acting on the wheels. It has been entirely overlooked that mechanical labour is far less efficient than the progressive power of the feet and lower limbs, so that it was far more laborious to move a mile with one of these machines than to walk five. It was also forgotten that the class of persons who would be likely to use velocipedes would be speedily fatigued by any kind of labour or motion to which they had not been accustomed. Every kind of velocipede hitherto introduced has therefore remained a useless toy.

The subject is, however, by no means exhausted, and due attention to certain practical principles would enable a velocipede to be constructed of some real and practical use. Having paid considerable attention to the subject when they were first introduced, with a view to their improvement, I will detail, for the benefit of your correspondent, the result of my enquiries.

It appears that a very important power of producing motion has been entirely overlooked, or has been very inefficiently applied. I mean the weight of the human body. The average weight of a man is about 140 or 150 pounds, and this judiciously applied, would give a power nearly equal to the average draught of a horse in drawing a light carriage.

Let a carriage be constructed with two wheels of 5 or 6 feet diameter, and with a third wheel of smaller diameter placed behind, moving on a pivot, as in a garden chair.

The axle of the front wheels is to be cranked, and to these cranks stirrups are to be attached, on which the weight is to be thrown alternately. The motion has too much of the treadmill character to be agreeable, and this carriage could only be used to enable a man to carry an invalid for exercise, for which purpose a light seat behind would be required, and also four wheels instead of three. To render this motion agreeable, it could be contrived so as to resemble the exercise of riding on horseback. The stirrups are to be placed on the same crank, and the rider is to throw his weight alternately from the seat to the stirrups. The seat is to be shaped like a saddle hinged in front, and with a powerful and elastic spring under the back part. When the rider leans forward, great part of the weight is taken off the seat, which throws him forward with his weight on the stirrups. By these means the fatigue of continually rising from the seat is prevented, the action resembling that of rising in the saddle when on horseback.

A third stirrup fixed on an opposite crank for occasional use would enable the first-described mode of progression to be used at pleasure, or when greater power was required.

I will now describe that kind of velocipede, which I believe to be superior to any other with which I have become acquainted, and which I believe, is capable

of being rendered of considerable practical utility. It is but a slight alteration on the plan of Mr. Sievier already described. Two wheels of about 6 feet diameter, of the lightest possible construction, are to be placed between 3 and 4 feet apart, connected by an axle board forward, and carrying a seat properly balanced, and raised a proper height. From both the back and front of this seat, a bar is to pass obliquely downwards. At the end of each of these bars a wheel is to be placed of from 12 to 18 inches diameter. These wheels are to reach within 6 or 8 inches of the ground.

The rider is to have two stilts made of bamboo, or other very light material, extending from 18 to 30 inches below the feet; they are to have flat stirrups to support the feet, and to be properly arranged in construction.

It is obvious that each step of the rider would carry him many yards, and the action would not be fatiguing, as he would balance his weight in the intervals. The two small wheels are merely safety wheels, as the rider losing his balance would immediately rest on one or other of these wheels.

A carriage of this description would enable a person to travel on a level road from 12 to 15 miles an hour. It would be of infinite value in such weather as we have had this last winter, or on the frozen canals of Holland, and on a railroad, the wheels being adapted to the rails, information to be conveyed would enable from one point to another with the speed of a steam engine.

By having four wheels it could also be used for taking out a lady, or invalid for exercise.

I have omitted some minute details of construction which would not interest the public, but if your correspondent requires more detailed information, I will forward it in any way desired.

AN AMATEUR.

Feb. 10, 1841.

RATIONAL PHILOSOPHY.—LETTER II.

SPACE.

Sir,—Space through which the planets are moved is a plenum.

Of this being the natural fact, the discovery is deduced, first, from the function of the optic sense.

While modern philosophy maintains that vision is promoted by means of image-making rays of light entering the eyes, it maintains also, that the eyes possess sight which enables them to look abroad to the very stars. Now, of what use is an image on the retina, if the eyes see the body itself to which they are directed; or, if an image were on the retina for the mind, somehow to know, then is the image the perceived object, not the external body, and eye-sight has no office to perform. There can be nothing more unreasonable than the notion, that filling the eyes with rays of any kind could make the spherical eye-balls dispose such rays on the retina, so as to represent on this branch of the optic nerve an image or likeness of the outward object; that this image is conveyed up to the mind for its inspection; and that the mind in becoming acquainted with this image is seeing the body itself by means of eye-sight. These theories, collectively or individually are manifestly most irrational and absurd. The natural theory of vision, that is, of optically excited perception, we learn at once from the function of the sense. *The optic nerve, or rather its contents, the nervous fluid, being made to act impulsively on the chromatic organ of the brain, is productive of the sensation named colour, of which the mind is immediately sensible.* This is not eye-sight perception: it can be excited by a blow on the closed eye; also in the total absence of the eye as long as the retina remains naturally sane, but is unaccompanied with the idea of form. In this case light or coloured light is the perception, not what is known as distinct vision; which latter depends on the office of the telescopic lenses of the eye-ball. Then, as by this sense, light or colour is the whole our mind, that is, ourself, knows, and as the sensation would be useless were externals coloured and visible, it is conclusive that what is considered seeing a coloured body, is but being conscious of the sensation colour, to which that body has been accessory in promoting, and to which of necessity the sensation belongs apparently, as but apparently is the mental effect, taken for the moon's image on or 240,000 miles beneath the surface of a pond, and the moveable image of the face far behind the surface of a looking glass.

Having thus established that knowing any certain body is before our eyes is not

by eye-sight or any perceiving faculty possessed by the eye-balls, but in consequence of the sensation, colour, which that body promotes, being seemingly located at and seemingly the colour of the body; and having shown the absurdity of image making rays promoting distinct optic perception in the mind, we find ourselves in possession of the following facts, deducible immediately from the physiology and functions of the optic sense, which are applicable also to the perceptions excited by all the other senses. First, the brain must be excited for the production of the perception. Second, the external object is concerned in promoting the cerebral excitement. Third, the sense excited perception seems to belong to its external promoting cause.

From these premises the question arises, how is the brain affected by a remote star: or, how are the contents of the optic nerve so affected by the star, as to make them excite the optic organ of the brain. That the star promotes the perception in the mind is evident from the perception ceasing and being renewed every time the eyes are turned from and in the direction of the star; and as immediate contact between the star and retina is wholly out of the question, it is obvious there must exist an intermediate means which the star affects, so as to make it affect the contents of the optic nerve. As did the star by its inline continuous with the axis of vision, intercept the general pressure on the nervous fluid, so would the brain be particularly excited or suffer change of excitement, and the mind experience within itself the perception which is to us as seeing the star. And as in every direction of the eyes the brain becomes similarly affected by stars, there is just reason for inferring that visional perception is promoted by a quiescent medium; and that nothing short of a medium filling space can answer every such visual purpose. There are other and equally cogent reasons to be hereafter mentioned, in confirmation of space being a plenum.

By thus coupling a correct knowledge of the real functions of the senses with external sense exciting causes, the discovery is arrived at, not only that space is a plenum but that *the medium which fills space and the nervous fluid are the same;* inasmuch as that which a remote body makes act immediately on the brain, must be continuous from that body to the brain, therefore from the brain through the sense to be in contact with the external body, however remote that body is from the brain.

That space is a plenum is discoverable also from planetary motion.

A planet cannot move itself, since its motion implies that something foreign to the planet is the moving cause.

Motion is the effect of physical impulse; and as in every instance cause is necessarily equal to effect, it follows that a planet is impelled throughout the entire of its orbit. Motion, after impulse has ceased, being so much effect without cause, nothing of the kind is possible. Therefore constant impulse, or impulse of the duration of motion, is inferable, and is rationally proveable in every instance of continuous motion. "Impulse once impressed" is no sufficient cause for an endless effect; nor from momentary rectilinear impulse could orbicular motion succeed. Change of direction of motion implies a novel impulse, which puts an end to all effect from a former impulse. Therefore, present orbicular motion is not indebted to any primeval projectile impulse; neither can anything but a constantly impelling and occasionally varying cause, account for a planet declining in motion at one time, and at another recovering its lost velocity.

In vacuo there could be no motion, there being no impelling cause present. Nature knows nothing of vacuity excepting perhaps between the atoms of matter of the smallest size, the diminutive interstices of which there is nothing to occupy. Hence, as motion and force are not transferable, and both but effects of impulse, so neither is cause of continuous motion; and as a body cannot keep itself in motion, constant impulse, it is obvious, is indispensable for the continuance of endless planetary motion. From which it is rationally conclusive, that space contains a medium on which planetary motion depends, as universal at least as the utmost bounds of the planetary system, and it will be found eventually that its services are equally universal.

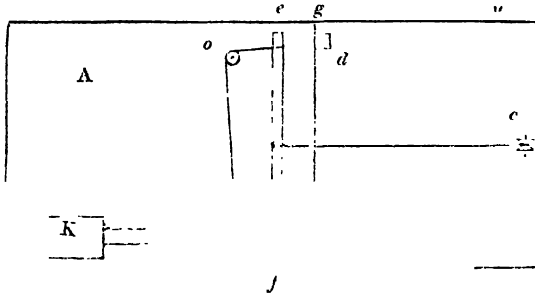
T. H. PASLEY.

Jersey, Feb. 8, 1841.

MECHANICAL DEMONSTRATION OF THE LOSS OF POWER IN THE CRANK AS AT PRESENT IN USE, SHOWING THAT THE DOCTRINE OF VIRTUAL VELOCITY ALONE IS NOT SUFFICIENT FOR AN EXPLANATION OF ITS ACTION.

Sir,—Many attempts have been made from time to time to investigate mechanically the action of the crank in the manner mentioned by your correspondent Mr. Clive, page 186, though by much better arrangements than he has described, but all the attempts in that way are very unsatisfactory; such arrangements cannot be made to comply with all the conditions necessary to such an investigation.

The experiment I am about to describe, is very simple, and within any person's reach, and in commenting on it, I will assume, for argument sake, and to facilitate the enquiry, that the doctrine of virtual velocity, or least action, does not admit, speaking of the crank, the abstract of any loss of power.



On a large table, A B, the surface of which was level, but not very smooth, I fixed two pulleys at *o* and *m*, with their axes perpendicular, and another pulley at *c*, with the axis horizontal; a cross bar, *e f*, has two lines at its extremities, one of them passing directly to the moveable board *k*, intended for putting weights on, the other cord passing round the two pulleys as shown in the figure; made fast also to the board *k*, there is a line *g h*, drawn square across the table a few inches in advance of the bar, and a stop at *d*, which can be made fast at any part of that line, so as to enable the experimentalist to investigate any angle of the crank. To the centre of the cross bar there is a line made fast at *h*, which passes over the pulley at *c*, and down under the table; there is a scale appended to this part of the line to hold weights; there is also a small scale of inches marked on the edge of the table at *f h*, commencing at *h*, which is zero, and marked 1, 2, 3, in each direction from that part; there is also a pointer attached to the cross bar at *f*, to point to this scale. It should be observed, that all the lines attached to the cross bar should be kept as nearly as possible in a parallel position. The cross bar I made use of was 2 feet long, which would represent a crank with a throw of 2 feet, and the angle I was analyzing was about 30 degrees, as the stop was placed at an equal distance from the line *h c*, as that line was from the cord at the other extremity of the line. Having made these arrangements, I put a weight of 56 lbs. on the moveable board *k*, and drew back that board with the cross bar attached, until the point of the bar was 2 inches from the line marked on the table. I then put a weight of 50 lbs. on the scale under the table, and found that was the smallest weight that would move the cross bar, keeping to the line drawn across the table. I then took off the 56 lbs. weight from the board *k*, and put [illegible] lbs. on in place of it, the cross bar at this time being stopped by the stop at *d*; the weight of 50 lbs. on the scale under the table was sufficient, as might have been expected, to draw the end of the bar now at liberty, 4 inches from the point *h* towards B. We have, therefore, 56 × 2 in. + 28 × 4 in. = 224 = 37.3 × 6 in.; a weight consequently, of 37.3 lb. put on the board *k*, when the bar is drawn back 2 inches, should, with

the weight in the scale of 50 lbs. be moved over a space of 6 inches, namely, 2 inches on one side of the line $g\,h$, and 4 inches on the other side, if it will do so. I must candidly admit that I committed sad blunders in attempting to investigate this question, and as a correspondent of your's observes (with a flippancy which might be expected from a person not well acquainted with the subject) that too much of your pages have been occupied with the subject. I find that the weight of 37½ lbs. moved over only 4 inches, when it should have moved over 6. I now varied the experiment, and taking the weight of 37 lbs. off the board k, I put another light board on the top of that board, and secured one end of the same to the table, so that the motion of the board k would not be impeded, while the upper board, on which I put the 37 lbs., was prevented from moving with it. On placing the cross bar as before, 2 inches before the line $g\,h$, and with the weight of 50 lbs. in scale, I found the end of the bar only passed over 2¼ inches, where it should have passed over 6 inches. How is this? what makes the loss of power in this case be greater than in the experiment previously made? or does the loss of power in the crank depend algogether upon the description of work required to be done by the engine, and is this or that description of work a necessary element in investigating the problem mathematically? It will be said that this experiment is very good as an enquiry into the laws of friction under peculiar circumstances, and very true it is, but it is the friction connected with the work to be done, which cannot, like the friction of the moving parts of the machine in a theoretical enquiry, be supposed to have no existence. Take for example, the problem to draw an iron spike from a piece of hard timber; on investigating the property of different contrivances for effecting this purpose, to ascertain the superiority of one over the other, we may, with great advantage, assume that there is no friction in the machine, but we cannot dispense with one particle of the friction connected with the spike and the timber; if we do so, we change the problem which was to be solved into a case very different.

In spinning factories all the work required to be done by the engine, consists of friction, and if the engine is suddenly stopped, all the works as suddenly cease; the same may be said of corn mills, and also with steam-boat machinery; the padple wheels are not sufficiently heavy in proportion to the magnitude of the engine, that the momentum would be a signal one moment after the steam is shut off, to keep the engine in motion. Not so with locomotive steam engines on rail roads; when the steam is shut off, the heavy train has sufficient momentum to keep the engines for some time in motion, notwithstanding all the friction they and the train are liable to. And this is a remark which is particularly worthy of the notice of all those persons who are spending large sums of money in endeavouring to make steam carriages travel on common roads, for the above facts show, that although there may be little or no loss of power in the crank of a railroad locomotive, yet the case may, and certainly is very different with the crank of the other description of carriages, and this circumstance is sufficient to account for the extraordinary success from the commencement of railway locomotion, and the utter failure of all common road locomotives, even with engines of great power, as compared with the light loads they have to carry.

The mathematicians I am inclined to think will not fall into the blunder committed by Tredgold, and contend that engines, on the principle of the rack and pinion, piston rod, or rotary wheel, considered theoretically, or in the abstract, would not have moved the board k in both the experiments mentioned—in one case, when the weight moved, and in the other, when it was stationary—on the upper board the entire space of 6 inches. And if this be not loss of power in one description of engine, which is not in another, I am at a loss to know what is meant by the word. It is mentioned by one of your mathematical correspondents that he is surprised that a Professor in a Dublin National School, should in his writings be an advocate for a loss of power in the crank, and he is shocked at the idea; but I beg to acquaint him, that Professors of Trinity College, Dublin, have published works containing the same views; my library not being very large, I cannot lay my hands at this moment but on one, namely, Professor Robinson's Mechanics.

Either the mathematicians, your correspondents, were acquainted with the facts of the experiment mentioned in this paper, and yet had not the candor and honesty to avow it, and explain to what extent their principles were applicable to solving the question, or they were not aware of the fact; yet do they all charge their opponents in most uncourteous terms with ignorance of the subject they are writing on! If they will be taught nothing else from their opponents, they may at least learn a little more of common civility. When a satisfactory explanation is given to show that these experiments do not interfere with the doctrine of virtual velocity, I will then show a further loss of power from other causes than what is given in this paper.

I remain, yours, &c.

M.

MR. WIGNEY'S SPECULATIONS ON HEAT.

Sir,—In Mr. Wigney's communication of your No. 911, the objections I had raised to his Theory of Heat, or rather his variations on the Theory of Dr. Black, are answered by a very summary conclusion, that an unexpected coincidence has arisen in the results of our separate reasoning. Mr. Wigney appears to congratulate himself, with hearty good will, on his own position, and plausibly assumes that all I have proposed, in contradiction to himself, amounts only to proof positive of his correctness—a comfortable philosophy this—but I have little fear of your intelligent readers being misled by vaunting language, which, instead of wrestling with a subject, treats it with a flourish of the pen. I now crave their indulgence for a few words in reply, on this somewhat longwinded subject.

Mr. Wigney in plain terms expounded, in his former letters, the application of his views on the question of the ebullition of water in an exhausted receiver; by supposing that the phenomenon results, from the mechanical force with which caloric rushes from the external atmosphere through the pores of the glass receiver, when the exhaustion is effected, to restore a fancied equilibrium. I had shown that external caloric had nothing to do with the displacement to which the water is subjected, by the formation of vapour and its violent liberation; for the phenomenon will not take place unless the water is, previous to its introduction, raised to, or above, the boiling point of water in vacuo; and when the pressure of the atmosphere is taken off, it arises from the elastic force of the superfluous caloric contained in the water itself: for throughout the experiment, and even when all is brought again to rest, the temperature of the water remains much beyond that of the external air, in its ordinary state. Surely here was a sufficient distinction to create a difference; for, by Mr. Wigney's argument, we are soberly to come to the conclusion, that a violent rush of caloric takes place from an external medium, at a comparatively low temperature to another which is at a higher. A common pulse glass will verify the correctness of what I have advanced. This is a sealed glass tube from which the air has been extracted, and contains a small quantity of water. Here, then, are the conditions of the experiment realized—water in a vacuum. Apply the warm hand to the bulb containing the water; remembering that the hand is at a temperature considerably above that which is necessary for the ebullition of water in vacuo, and that the external air, in its ordinary state, is considerably below that point. The water thus raised to its boiling point, by a supply of caloric conducted from the hand, commences to throw off vapour, which, in its violent escape, causes the commotion which has been commented upon, as long as the supply of heat is kept up; and this will continue, providing the extreme end of the glass tube is preserved sufficiently cool to condense the vapour as fast as it is produced. Remove the source of heat and the effect ceases. The atmosphere ought now to give up its caloric and continue the ebullition according to Mr. Wigney's hypothesis; but it will not interfere, for the laws of nature refuse to deviate from their constant course, to suit the wild imaginings of mere theory. Indeed, proprietors of steam generators would need to be very grateful to Mr. Wigney, if his idea was grounded on the slightest foundation; for they would only have to apply an exhausting pump to their boiler to draw off the steam as fast as it was formed, and the furnace

would no longer be required; the great store of atmospheric caloric would be at their command, for if it once commenced its work of vaporization, so long as the exhaustion were carried on it must necessarily continue. When vapour rises from water in an exhausted receiver, it will be accompanied by its equivalent amount of sensible heat, and its store of insensible or latent heat; but it appears to me a very unscientific method of arguing, as Mr. Wigney has done, for the presence of latent or insensible caloric in an absolute vacuum, supposing it to be attainable, (by quoting from me the evidence of the fluctuations of a thermometer introduced therein,) when it is self-evident that the only indication it is able to furnish, must be produced by caloric in the free or sensible state. All ponderable bodies require each their separate store of insensible or latent heat, in combination with their atomic constitution, and the amount or quantity they contain varies in every instance.

But the gist of Mr. Wigney's arguments seems to rest on his law of "equal diffusion" of heat. In fact, this and the law of "recession from the centre of the earth," are the principal novelties which he has presented to our attention, and it is by their evidence that I am so unceremoniously disposed of in Mr. Wigney's letter. Had these assumed laws been treated of in an abstract point of view, as forces to which caloric may be obedient when uninfluenced by the presence of matter, and unexposed to the superior powers which then overcome and control its own, I should not attempt to disturb Mr. Wigney's contemplation of their possible existence; but as, in his reply to me, he has given them a direct application with supposed physical energy, more powerful in following their own rule than the aggregate forces and affinities of atomic constitution to control it, I shall endeavour to point out, by a little practical test, their improbable foundation.

Where a heated body is placed in juxtaposition with a number of others at a lower temperature, its excesss of caloric is parted with by radiation, &c., to the surrounding objects, and when all are brought to the same thermometric level, we are to understand, by Mr. Wigney's law of equal diffusion, that the amount of caloric so distributed has been equally diffused to all. I have not seen any very specific definition of this principle of Mr. Wigney's; but we do not require to be informed that caloric is diffused throughout the universe, as far as our observations extend; that every various form of matter possesses its certain constant amount, varying with its sensible temperature; and that in all cases where two bodies of different temperatures are brought into communication with each other, transit of caloric will take place from the one to the other with greater or less facility; and the particular conditions under which this is effected are classed under the terms—radiation, conduction, transmission, diffusion, &c. All this we know; but Mr. Wigney contents himself not with the ordinary law of diffusion; his adddition or invention consists in an assumed equality in this law, which must be applied either to the times in which its passage, when in motion, is effected, or to the absolute amount or quantity being subject to equal division or dissemination; for however subtle or incomprehensible is the fluid caloric, its quantity is capable of admeasurement by its effects, with great precision. That it cannot be to the time or velocity of the transit we all know, for no property of heat is more constantly brought under our notice; caloric being conducted with so much greater rapidity by some classes of bodies than by others. From Mr. Wigney's application of the law, it appears to relate to an equality, or a constant tendency to equality, in the amount of caloric distributed throughout the material world, either proportioned locally to the bulk of each form of matter, or to its weight. Now, equal weights of different substances require the impartation of dissimilar proportions of caloric, to increase their temperature in an equal degree, with a corresponding thermometric indication. One body will retain or condense within its substance, a larger quantity of caloric than another of different aggregration. This law, so clearly opposed to Mr. Wigney's idea of the equal diffusion of heat, is not governed by inequality in bulk; or rather does not correspond universally with their specific gravities, as at first sight might appear probable; and, in fact, as Mr. Wigney must conceive to be the case; but it is an arbitrary fixed amount that may be ascertained with certainty by

experiment. If there were an equality in the diffusion of caloric, a pound of water would either require the same quantity of caloric imparted to it, as to an equal weight of mercury for a like elevation of temperature, or would demand a supply thirteen times as great; such being the different proportion of their specific gravities, and consequently of bulk, perhaps also of intervening space between their atoms. But what is the fact, as proved by carefully conducted experiments—for the specific heats of bodies are nearly as well ascertained as their specific gravities? Water requires twenty-three times the quantity of caloric which is required to produce an equal rise of sensible temperature in mercury. Spermaceti oil, which is of less specific gravity than water, actually requires but half the quantity of latent heat; and hydrogen gas, which is 12,000 times lighter than water, and consequently occupies 12,000 times the space, requires weight for weight, only three times the quantity of latent heat.

These facts, which, I trust, are sufficiently intelligible without a more lengthened detail, must certainly be a more convincing proof of the unequal distribution of heat, than any mere hypothesis to the contrary; and they admit of the simplest verification, for different metallic or other bodies of equal weight or bulk and equal temperature, will be found by comparison, as, by immersion separately in a given weight of cold water, to relinquish a very disproportionate amount of heat one with the other, as proved by the rise of temperature of the water in each instance being unequal. When the experiment is reversed, as by the introduction of bodies at a low temperature into heated water; and each is brought to a balance of temperature with the medium in which it is placed, the abstraction of heat from the water will be found to follow the same rule of inequality.

That caloric should exist in combination with material bodies under two states of relationship, is a question long considered unsatisfactory; but which remains in vogue for want of a better. I had looked in vain through Mr. Wigney's communications, for any new argument that may throw new light upon the subject. Reasoning from analogy it would appear, that as the quantity of latent or dormant caloric within a given space, is regulated by the specific affinity, if I may so term it, of the material atoms therein contained; decreasing not in an exact ratio, but to a considerable extent, as the density or number of atoms; decreases then in an absolute vacuum, which is deprived of the pressence of all matter, there should remain no demand for other than free or sensible caloric. It is difficult to conceive any elective power of affinity in vacuity, by which caloric can be brought into a condensed form, for it would be nonsense to suppose, that an elastic fluid would condense itself. I beg Mr. Wigney will no longer consider me a convert to his opinion on this point, for it would require a flight of imagination far beyond an ordinary scope, to appreciate the balance of forces which would cause so elastic a fluid to become dormant and inactive; changing from the active state which it must have possessed in its transit, and parting with its repulsive property on entering the latent state, without the presence of any other agent to effect it, than its own propensity of equal diffusion.

Mr. Wigney's proposed secondary law of "Recession from the centre of the earth," to which caloric may be subject, does not appear to me supported by a single evidence in the kingdom of Nature. His quotation of my example of the ascent of warm water to the surface of cold, is singularly infelicitous; he has stumbled on the law of specific gravity which is influenced solely by a change of density or volume. The centripetal force of the heated portion of the liquid, is lessened by the increase of bulk consequent on the rise of temperature, and the more powerful gravity of the colder medium causes it to descend, and displace the former in obedience to this law; but an enlargement of bulk may take place unaccompanied by an increase of temperature. Water at 32° rises to the surface of such as is at 39° or 40°, and the density of water is greatest about 40°, and it will be found to descend in a surrounding medium of higher or lower temperature.

In attributing the motion of the blood through the veins, to the mechanic action of the heart, I intended to convey an idea of its action exactly resembling that of a steam engine, or other source of power,

made use of to pump the supply of water through the ramified mains in the streets of a town. This was unquestionably distinct in its aim and end from Mr. Wigney's suggestion, which compared the cause of motion to that produced in his refrigeration, which results from a change of specific gravity arising from change of temperature.—I am afraid of trespassing too much upon your pages, and must conclude with reminding Mr. Wigney that logical deductions from tangible grounds, are more convincing and satisfactory than jumping to conclusions without previously establishing the correctness of the proof.

I am, Sir, your obedient servant,

A. Y.

Brighton, February 1, 1841.

WHITWORTH'S PROPOSED PADDLE-WHEEL, NOT NEW.

Sir,—Having read in No. 899 of the *Mechanic's Magazine*, the description of an "Improved Paddle-wheel," I beg leave to inform you (without the slightest wish to disparage Mr. Whitworth's ingenuity) that the invention of moving the floats by the aid of pins or rollers working in a concentric or eccentric groove fixed to the vessel's side; and also in slots in the radial arms of the wheel, is by no means new.

In the year 1831, when in England, I invented a paddle-wheel, the floats of which were worked by the before described machinery; and have still in my possession a model and drawing of the same.

By giving insertion to the above in your valuable Magazine you will oblige,

Sir, your obedient servant,

A SUBSCRIBER.

West Indies, Dec. 27, 1840.

ON CALCULATING LIFE ANNUITIES.

Sir,—Your correspondent, "W. P.," requires a short and more approximate rule for finding the present value of 1*l.* annuity (depending upon any given age and for any limited time,) than what is obtained from the theorem $P = \frac{1}{a}\left(\frac{b}{1+r} + \frac{c}{(1+r)^2} + \&c.,\right)$ or $P = \frac{1}{a}\left(\frac{b}{R} + \frac{c}{R^2} + \frac{d}{R^3} + \&c.\right)$ Now a more approximate rule than what is exhibited by the above equation is impossible, and for this reason, the general value of P is the *true value* of the thing sought for, provided the table of the probabilities of life holds generally true. I willingly admit, however, that when the number of terms in the series are many, the labour of calculation is rather appalling; but if it should happen, (which is sometimes the case,) that the numbers living by the table at the beginning of each successive year form a series in arithmetical progression, or what is the same thing, if the decrements of life are constant, then the present value of 1*l.*, annually subject to the risk of life, instead of being found from the theorem $P = \frac{1}{a}\left(\frac{b}{R} + \frac{c}{R^2} + \frac{d}{R^3} + \&c.,\right)$ may be found from the equation $P =$

$$\frac{b\left(R^{n+1}+1\right) - \left(R^{n}+R\right) - D\left(R^{n}-R\right) - (n-1)\,.\,(R-1)\Big)}{a\,R^n(R-1)^2},$$

$$\text{Or, } P = \frac{b\,(R^n-1)\,r - D\,(R^n - R) - (n-1)\,r)}{a\,R^n\,r^2}.^*$$

Where a is the number living at the given age, b the number alive at the end of one year, D the constant decrement of life; n the number of years, and R the amount of 1*l.* for one year; as an example: find the present value of 1*l.* annuity on a life, aged 23, for nine years, rate of interest 4 per cent., by the Northampton Table of Probabilities. By the said Table the value of D is constant, and = 75, also a=4910, b=4835 n=9, and R=1.04.

* The investigation of the theorem, for the present I shall leave as an exercise for any of your algebraical contributors.

$R^{n+1}+1=(1.04)^{10}+1=2.48024427$

$R^{n}+R=(1.04)^{9}+1.04=2.46331180$

0.01693247

Multiply by b = ... 4835

Product A 81.86849245

$R^{n}-R=(1.04)^{9}-1.04=$ 0.38331800

$(n-1).(R-1)=8\times .04=$ 0.32

0.06331800

Multiply by D = 75

Product B = ... 4.74838500

Numerator A — B = ... 77.12010745

$R^{n}=(1.04)^{9}=$ 1.42331180

Multiply by $(R-1)^2=(.04)^2=$ .. .0016

0.0022772888

Multiply by a = ... 4910

Denominator = ... 11.18153750

Hence, 77.12070745÷11.18153750= 6.89710=P the required present value sought.

If "W. P." has fortitude to calculate the value of P, from the theorem $P=\frac{1}{a}\left(\frac{b}{R}+\frac{c}{R^2}+\frac{d}{R^3}+\text{\&c.,}\right)$ he will find it to be exactly what we have calculated it to be.

Now to see how far the above theorem can be depended upon, when the numbers living by the Table at the beginning of each year are not *in arithmetical progression*, or when the decrements of life are not constant. Thus, suppose it were required to find the value of P (from the theorem,) for an age of 10 for 10 years, interest 4 per cent.

The number that die between 10 and 20, by the Northampton Table, is 543, and this in the supposition that an equal number die each year, will give the mean value of D = 54.3; also a = 5675, b= 5132, and R=1.04.

$R^{n+1}+1=(1.04)^{11}+1=$ 2.53945404

$R^{n}+R=(1.04)^{10}+1.04=$ 2.52024427

Difference 0.01920977

Multiply by b = ... 5623

Product. A 108.01653671

$R^{n}-R=(1.04)^{10}-1.04=$ 0.44024427

$(n-1).(R-1)=9\times .04=$ 0.36

Difference 0.08024427

Multiply by D = ... 54.3

Product . B	....	4.35726386
Numerator A—B=	....	103.65927285
$R^n \times (R-1)^2 =$	....	0.00236839
Multiply by a =	....	5675
Denominator	....	13.44061325

$$\text{Hence, } P = 103.65927 \div 13.44061 = 7.71239$$

The exact value of P we have computed from the true theorem, and find it to be 7.72839. The difference between the two values of P is £.016, or 3¾d., and if the value of the annual premium of assurance for 100*l.* be computed, the error by the approximate theorem would only amount to 2¼d. The common periods of assurance in most of the London offices (besides the whole term of life,) are generally for short periods of five and seven years; in these cases the approximate theorem which we have given, will determine the single or annual premiums very near the truth, provided the given age lies within the limits of 10 and 75. But when a table is wanted for the single and annual premiums for periods of 5, 7 or 10 years, I would compute the value of P for the youngest life, from the true theorem. And then the successive values of P, P′, P″ &c., for 1, 2, 3 &c., for years more; can be determined without having again recourse to the theorem $P = \frac{1}{a}\left(\frac{b}{R} + \frac{c}{R^2} + \frac{d}{R^3} + \&c.,\right)$ except for the purpose of verification.

A very great reduction has taken place within the last 25 years in the annual premiums of assurance for given periods, and also for the whole term of life. The calculations on this head of assurance were then deduced from the Northampton Table of Probabilities, which gave most enormous profits to the proprietary, about the period alluded to, the annual premium for assuring a good life, aged 20, for seven years, was 1*l.* 9*s.* 5*d.*; in taking the average of six of the London offices for the present time, I find the annual premium to be only 1*l.* 0*s.* 1*d.*, being a difference of no less than 46 per cent., and the difference per cent. on the same life, for the whole duration, is 31*l.* Still, notwithstanding the great reduction that have been lately made in the annual premiums, a greater reduction might still be made, more particularly so on young lives, where the profits in the different offices still range between 30 and 40 per cent., but not nearly so much on aged lives, but on this part of the subject I will enter more into detail in my next communication.

I am, Mr. Editor, yours, &c.

GEORGE SCOTT,
Private Teacher of the Mathematics.

21, New Church-street, Grove Road, Paddington, March 24, 1841.

ON WORKING STEAM EXPANSIVELY—SUPERIORITY OF CORNISH LIFTING ENGINES.

Sir,—It is important that the cause of the advantages gained by working steam expansively, should be well understood. Your correspondent, "Alpha," of Limehouse, appears conversant with the subject. May I therefore venture to ask him to give his opinion on the question, especially, why the Cornish pumping-engine can attain to a duty of 120 millions, while the best Cornish crank-engines (also working expansively) can only attain to a duty of 40 millions. There it no loss of power in the crank, if we except friction; this, I think is capable of a very simple demonstration, although we have been favoured with some *profound* calculations in your pages, with the intent to prove the contrary.

M. I. R.

Norwood.

IMPROVED METHOD OF WOOD PAVING.

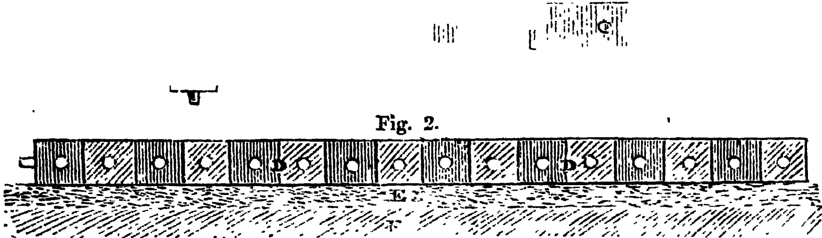


Fig. 2.

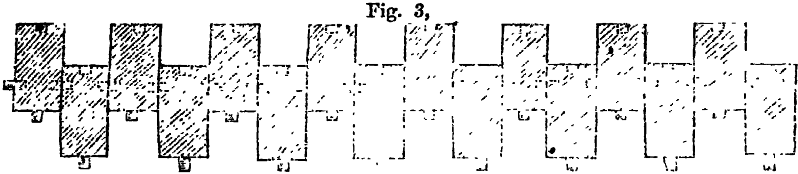


Fig. 3,

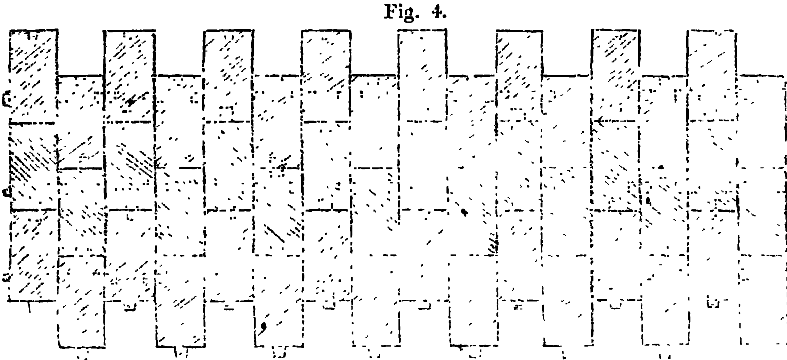


Fig. 4.

Sir,—I beg leave to send you a diagram illustrative of a combination of wooden blocks for street pavement, which appears to me to possess some advantages over any of the methods which I have yet seen followed; the figures will be sufficient to explain the combination I propose, without much description.

Fig. 1 shows four views of the blocks, which are simply double cubes, of 6 inches; A, is a plan; B, an end elevation; C and D side ditto.

Fig. 2,—Is an elevation of a row of the blocks, with a section of the bed; D D, are the blocks; E, a layer of small road metal; F, the substratum levelled, rammed and drained.

Fig. 3 shows one double row detached.

Fig. 4 represents three double rows combined.

The peculiarity of the plan is, that each block is connected on its four vertical sides with the adjacent ones, and each double row, before being shoved into its place, may be united throughout the whole of its length, by substituting a rod of iron for the dowells, the blocks in this case being bored through, and the iron rod having a sunk head at one extremity of the row and a screw and nut at the other to bind the whole together.

The blocks may of course have any convenient dimensions, but perhaps double cubes of 6 inches would answer well when a good bed can be afforded.

K. H.

P. S. When hexagonal blocks are used, they would be improved in stability by having each row bound up on an iron rod as recommended for the double cubes.

THE SHRAPNEL PATENT CORKSCREW AND BOTTLE.

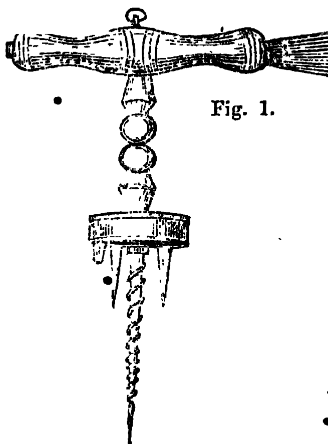


Fig. 1.

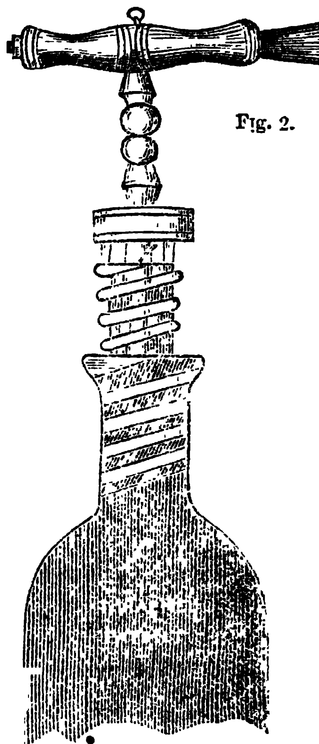


Fig. 2.

Sir,—When we are about to enjoy the society of our best friends, and in evidence of our sincerity, have selected some of our "double diamond" port, we cannot endure the peril of disappointment by breaking the cork, already sufficiently tender from age, by the use of the present corkscrews; and having now secured a substitute which will most completely remove a cork, however decayed, we think we should be chargeable with selfishness if we did not introduce it for general adoption. This invention is admirably adapted for common bottles; but *exclusively* so, for the Patent Shrapnel Bottle, which not only renders the bottle perfectly air tight, but so firmly grips the cork, that wire or string even for ales, porter, ginger beer, &c., are perfectly unnecessary; and when it is considered that the wiring of the bottles used for those purposes, forms the ***most material*** part of the manufacturer's expense, the use of both articles becomes exceedingly advantageous, and particularly so, when the cost scarcely exceeds that of the common bottle.

In the above Engravings,

Fig. 1. Represents the corkscrew, with three spikes pressing perpendicularly into the cork, (the former acting on a centre attached to a plate) as the worm enters, until they are embedded in the cork; the stop (see Fig. E), then catches a rack, thereby causing the spikes to cease running on the centre, and the cork is immediately turned and extracted from the bottle.

Plate 2. Represents the patent bottle, G, having a female screw cast in the neck, and is particularly adapted for holding effervescing liquors, champaigh, wines, porter, bottled ales, &c., thereby rendering it perfectly air tight, and pre-

cluding the necessity of having wires as heretofore. The cork being driven in in the usual way, naturally expands in the screw, and by means of the great power of the corkscrew, D, is unscrewed from the bottle in the form of fig. F; the corkscrew is also adapted for any other bottles; however decayed or tight the cork, it has the power of extracting it with the greatest facility.

Yours', &c.

G.

ON THE SUPERIOR DUTY OF CORNISH ENGINES OVER ROTATIVE.

Sir.—Permit me to make a few observations in reference to the papers of "Scalpel" and "Alpha;" who, though they have not anticipated my own thoughts, may *seem* the first to give them publicity: and it is not a little singular there should be so many coincidences between my views and those of others at this time, "Scalpel's" and "Alpha's" papers, and Mr. Hall's and Mr. Holme's inventions. Mr. Holmes's specification contains almost the exact boiler supply invented by myself, but I thank him for taking it first, as it caused me to invent another I like better.* Mr. Hall I found (just in time to keep it out of my specification), invented, some years ago, a plan for saving the power lost by lifting the injection water out of a vacuum, and regulating the same; but I may thank him also, as I replaced it by one I much prefer.

I did not intend to say anything about the substance of the papers alluded to, until my patent was before the world; but without a little explanation, it would naturally be considered that I took my ideas from them.

There is so much similarity between their opinions and my own, that I trouble you with the following facts, which I can substantiate by the date of my drawings and explanations duly attested.

For many years past I have made experiments upon and connected with the steam-engine; and must confess that I was (years since), some little time delayed in improvement by that error, called a rotary engine; soon finding out its inherent defects, I turned my whole attention to the reciprocating engine, and have done that which (I believe Mr. Babbage says), all inventors must do, invented many things that have been invented before; when in the early part of the spring of last year I was requested by some friends to assist in investigating the efficiency of certain improvements in the steam-engine, &c., in relation to navigation, when the well-known, or rather *formerly* well-known) difference of cylinder and condenser vacuum, thrust itself very prominently before my mind, and became a matter of great interest to me. This caused me, after a little reflection, to invent the engine I am bringing before the public, which will prevent the loss now sustained from this cause; and on the 6th of June, 1840, I gave my invention "a local habitation and a name," by putting it upon paper, and which I think will prove the most valuable improvement since that of Watt's upon Newcomen's engine. In the middle of the same month, I applied through your office for a patent, which was granted, and sealed upon the 10th of September following.

About the time I applied for this patent, I was pleased to see a controversy commence in your Journal upon the subject of condensation, and to find that "Scalpel" so vigorously brought this subject before the public; and resuscitated that point which seems of late years to have nearly escaped the notice of inquirers generally; the difference between the cylinder and condenser vacuum; a fact which could not have been better established than by the diagram produced in *contradiction*, when the difference was shown to be, under the most *favourable circumstances*, (inches. $30\frac{1}{2} - 12.3 =$ lbs.) nearly $4\frac{1}{2}$ inches of mercury or $2\frac{1}{4}$ lbs. upon the square inch; and this is one of the chief causes of the superior duty of the Cornish engines followed in my mind as a matter of course; but when my other patents are secured I will trouble you with some further remarks in illustration of the following reasons for the extraordinary duty of these engines over rotative—with the causes of the fallacy of the results given, and the

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* The writer refers to a specification enrolled, of a patent recently obtained by him for "Naval Architecture and apparatus connected therewith, affording increased security from foundering and shipwreck." Enrolment Office, March 3, 1841.

conclusions drawn from the barometer gauge *when* attached to the *eduction passage*, explained by experiment.

The reasons above alluded to are—

1. The use of steam of high pressure, *used expansively*.

2. The better mean exhaustion of the cylinder.

3. The reserving so much of the steam in the cylinder, which acts as an elastic cushion, &c.

4. By better clothing and preventing radiation of heat.

In reference to "Alpha's" paper, I would observe, that I fully agree with him as to the great saving to be effected by working the steam expansively to "its fullest extent." With my engine I intend to expand the steam to the fullest possible extent; and wherever the steam (in low pressure engines) now enters the condenser at 212° or atmospheric pressure, I will get the same duty with only *one fourth* of the fuel. In conclusion I beg to observe, that my inventions and opinions are quite independent of the parties I have named.

I am, Sir, your's respectfully,
JAMES PILBROW.

Tottenham Green, March 21, 1841.

THE GAS MANUFACTURE.

Sir,—Being interested in a small gas establishment, I have read the communication of Mr. John Thomas, of Wem, Salop, in page 61 of your Magazine of January 23rd, 1841, and should feel much obliged to that gentleman, if he would give me a few more particulars respecting the working of the coke oven and retort described. The coke oven is said to be of a circular shape, 7 feet diameter; the *bottom*, (I suppose the bottom to be circular as well as the top), laid with fire bricks. Is not this oven of immense size, much larger than required? and ought not *every* part of it that is exposed to the action of the fire to be built with fire bricks? I do not understand how the retort is set in the oven; is it in immediate contact with the fire? I suppose from the description that it is suspended in the oven, or resting only on the walls on each end. How many times in the 24 hours is the retort charged, and with what quantity of coals each time? What quantity of coke does a ton of coals produce in the retort? What is the quantity of gas made from a ton of coals? The number of lights supplied is a very imperfect criterion, as some persons with one light consume as much gas as others with three or four. What is the peculiar construction of the oven, in consequence of which no draught is required? It appears that after the oven is charged, the door is completely closed, and no more attention is required, till it is drawn and charged again.

I have a coke oven 4 feet in width, and 2 feet in height, forming nearly a semicircle. On the crown of this oven, under another semicircular arch, 2 retorts are placed, 1 foot in diameter, and 6 feet, 6 inches long. To the oven and retorts are flues, in the usual way, with a damper where the flues enter the chimney. The oven is charged once in 24 hours; the door is then partially bricked up, holes being left for the admission of air, and for about 14 hours out of the 24 these apertures require to be closed more and more, till at last they are completely closed, and the whole plastered over, at the same time the damper is shut more and more, till it is shut close. The retorts are charged with 1 cwt. of coals each, and 3 charges are got off in the 24 hours, making on an average 8,000 cubic feet of gas to the ton of coals, and 13 cwt. of coke. The coke pays for the coals used, and only one man is required. If more gas is wanted, the oven must be charged oftener. By charging the oven twice in the 24 hours, we would get off five or six charges from the retorts. The retorts have been in use 10 months, and seem likely to last three or four months more. The difficulty is disposing of the large quantity of coke made when ovens are constantly used. We can only use one oven in summer, and even then we get several thousands of bushels of coke in hand for winter use. The greatest desideratum appears to be to get the greatest quantity of heat from a given quantity of fuel. If by any peculiar construction of a coke oven 5 or 6 cwt. of coals could be made to do the work of 7 or 8 cwt, this would be a very great improvement for small gas works, as the quantity of coke for sale would be less, and could be well disposed of. Is a circular oven preferable to a semicircular one? I should think it is, but have not seen it tried. If your

correspondent could communicate any information on this point, I should be much obliged to him. The coke oven and retorts above described, were put up by Messrs. Barlow and Co., 32, Bucklersbury, London.

Yours' respectfully,
OBSERVER.

SCIENTIFIC OBITUARY.

[From the Annual Report of the Council of the Institution of Civil Engineers.]

The Institution has to regret the loss by death, of Mr. Francis Bramah, Mr. Oldham, Mr. Rowles, and Mr. Rickman; individuals distinguished for their attainments in professional and general knowledge, and endeared to the Institution by long association and deep attachment to its interests.

Francis Bramah was the second son of the late Mr. Joseph Bramah, whose numerous inventions, perfection of workmanship, and genius in the mechanical arts, have rendered his name so widely and justly celebrated. The opportunities afforded to the son were ardently embraced by a mind of no ordinary powers, deeply imbued with the love of knowledge. Although his attention was in early youth more particularly directed to branches of minute mechanical construction, his acquaintance with the principal departments of professional knowledge and general science was very extensive. His attachment to the arts and to science was deep and sincere, and among many proofs of this may be particularly mentioned the valuable and essential services which he rendered to your late Honorary Member, Thomas Tredgold, both in his professional pursuits and in the prosecution and verification of his theories and calculations. Mr. Bramah being professionally engaged at Buckingham Palace, in connexion with some other engineers, difference in opinion existed and discussion arose, as to the true principle upon which the strength of cast-iron beams to resist stress and flexure ought to be estimated, and with the view of verifying the principles laid down by Tredgold, he instituted a very extended series of experiments, on the deflection and strength of cast-iron beams. These he presented to the Institution, and they are published in the Second Volume of your Transactions.

Several important works were executed under his direction, among which the iron work of the Waterloo Gallery at Windsor Castle; the cranes, the lock-gates, and their requisite machinery, at the St. Katherine's Docks; and the massive gates at Constitution Hill and Buckingham Palace, may be particularly mentioned. Mr. Bramah was an early and deeply-attached Member of this Institution; his constant attendance at the meetings, the information which he communicated, and his unwearied zeal as a Member of the Council, cannot be too highly estimated, and his loss will be deeply felt and regretted within these walls. The variety of his attainments, his refined taste in the arts, his amiable character and the warmth of his affections, had secured to him the respect and esteem of a most extensive circle of friends, by whom, as indeed by all in any way connected with him, his loss will be most deeply and sincerely felt.

John Oldham, the Engineer of the Banks of England and Ireland, was born in Dublin, where he served an apprenticeship to the business of an engraver, which he practised for some time, but subsequently quitted to become a miniature painter, wherein he acquired some reputation. He pursued this branch of the arts for many years, but having a strong bias towards mechanical pursuits, he devoted much of his leisure time to the acquisition of that knowledge which was to prove the foundation of his future celebrity. In the year 1812, he proposed to the Bank of Ireland his system of mechanical numbering and dating the notes, and on this being accepted, he became the chief engraver and engineer to that establishment. The period of twenty-two years, during which he held this appointment, was marked by continually progressive steps of artistical and mechanical ingenuity. The various arrangements which he projected and carried out attracted great attention, and conferred considerable celebrity on the establishment with which he was connected.

The late Governor of the Bank of England, Mr. T. A. Curtis, had his attention directed to these important improvements, and under his influence the whole system of engraving and printing as pursued in the Bank of Ireland was introduced into the national establishment of this country, under the superintendence of its author, who continued in the service of the Bank until his death.

The ingenuity of Mr. Oldham was directed to other objects, especially to a system of ventilation, of which an account was given by the author during the session of 1837. Great versatility of inventive faculty, persevering industry, and social qualities of the highest order, were the prominent features in his character, and the success which attended his exertions is one of the many gratifying instances to be found in the history of this country, of talents and industry destitute of patronage attaining to eminence in the professions to which they are devoted.

Henry Rowles, the Chairman of the Rymney Iron Works, was educated in the office of his relative, Mr. H. Holland, the archi-

tect, on quitting which he entered into business as a builder. He was engaged among other extensive undertakings in building several of the East India Company's Warehouses, the Royal Mint, the Excise Office, and Drury Lane Theatre. He was an active Director in several Docks, Railway, and other Companies, and finally became managing Director of the Rymney Iron Works, in the active discharge of the duties of which office he continued until his death. The Institution owes to him the Drawings of the Iron Works made by Mr. Richards.

John Rickman was educated at Lincoln College, Oxford, and graduated there; he subsequently devoted himself to literary pursuits, to political economy, and to practical mechanics. For some years he was conductor and principal contributor to the "*Agricultural and Commercial Magazine.*" In 1801 he removed to Dublin, as Private Secretary to the Right Hon. Charles Abbot, then Keeper of his Majesty's Privy Seal in Ireland. Upon the election of Mr. Abbot to the Speaker's Chair in the House of Commons, Mr. Rickman continued to be his Private Secretary, and in 1814, he was appointed to the table of the House of Commons. He also acted as Secretary to the two Commissioners appointed by Act of Parliament in 1803, "for making of Roads and Bridges in Scotland, and for the construction of the Caledonian Canal," and to the Commissioners " for building Churches in the Highlands." The ability and energy which he displayed in the discharge and conduct of the duties of these laborious offices, for more than thirty years, in addition to his constant attendance at the House of Commons, called forth the warmest acknowledgments of public meetings held in the Scotch counties on his retirement, and various resolutions were passed expressive of the sense entertained of the unremitting exertions, and uniform and disinterested assiduity, with which he had promoted every object connected with the improvement and general prosperity of the Highlands and Isles of Scotland. The conduct of the affairs of the Highland Commissioners brought Mr. Rickman into constant intercourse with their engineer, Mr. Telford; an intimate friendship was formed between them; and Mr. Rickman completed and published the account of the Life and Works of that eminent man, which was but partially arranged at the time of his decease.

Mr. Rickman's chief work is the Census of Great Britain, in six folio volumes; he is also the author of numerous papers connected with Statistics, having bestowed great pains in collecting and arranging the returns connected with education and local taxation. To this Institution he rendered very essential services, and whenever application was made to him in its behalf, was always zealous in endeavouring to promote its interests. The Library was enriched by him with two copies of the Life and Works of Telford, and as the acting executor of Telford, he endeavoured to carry out, by every means in his power, the intentions of that great benefactor of the Institution.

Mr. Rickman's acquirements in every department of knowledge were accurate and extensive; to great quickness of perception, and memory of no ordinary power, were added indefatigable industry, undeviating method, and a sound critical judgment;—qualities which caused his acquaintance to be highly valued by the most distinguished literary characters of the day, and which, no less than the strict and scrupulous sense of justice and honour, which particularly showed itself in his considerate kindness towards all those with whom he was connected, will occasion his loss to be deeply regretted by a widely extended circle.

ON THE ACTION OF LIGHT AND AIR, AND THE DISTRIBUTION OF THE ATMOSPHERE OVER THE EARTH'S SURFACE.

Sir,—This paper appeared in the columns of your valuable Magazine in December 1838, and is now published again, with the addition of several facts, which to the author appear to be important to science.

The object of the paper is to show, that the effects ascribed to the sun's heat, are produced by the combined action of light and air; that the distribution of the atmosphere over the earth's surface, is effected and regulated by the earth's rotation on its axis; and that the degree of the sun's heat at any given point, is in proportion to the intensity of the light and the density of the atmosphere at that place. Some observations are also added, on the nature of heat and light from the compression of air.

To the effect produced by the burning glass, whether it be the burning of a piece of wood, or the melting of a piece of iron, both light and air contribute. It is certain that both those agents are present in the operation, and we do not know that any other agent is present; and in the absence of either of them, the burning glass will not burn. If a light from a lens which sets substances on fire, be thrown into the same substances in an exhausted receiver, it will produce no perceptible effect. It will not ignite gunpowder. If a burning light be thrown upon gunpowder, in a glass receiver well exhausted, it produces no perceptible effect, so long as the vacuum is tolerably good; as the air returns into the receiver, (and it cannot long be kept out), the grains

of powder begin to smoke and jump about; but the light will not inflame them until the receiver is replenished with air. Hence, it is certain, that gunpowder cannot be inflamed in a vacuum. A burning light thrown upon paper immersed in water, does not burn it, because the water excludes the action of the atmosphere; and not as is commonly said, because the water absorbs the heat before it can act on the paper. This is evident from the fact, that the light will burn the paper when passed through the water to it. Thus, take a flat transparent glass phial, an inch or two thick, and two or three inches square; fill it with pure water, and place it between the lens and the paper, so that the light must pass through the bottle of water, and it will then burn the paper. In this case, allowing for a little dispersion which takes place in passing through the water, the light acts with undiminished energy. If the water absorbed the heat, it would absorb it in both cases, and the ray of light in each case would be equally powerless; but it is not so; and the reason is, that in the former case, the paper is protected from the action of the air, and in the latter, it is not. If a burning light from a lens be thrown upon the hand immersed in water, it causes a pricking sensation; if it be thrown upon sealing-wax so immersed, the wax crackles; globules of air arise from the focus, and the parts which it has touched are pitted and made rough by the bursting forth of the fluid. If such a light be thrown upon a piece of wood, unpolished iron, dark coloured flint stone, or dark coloured cloth immersed in water, globules of air also arise from the part touched by the focus. This is the incipient process of burning, which, when exposed to the action of the atmosphere, that element completes. That the globules in all these cases are air, may be easily ascertained in the following manner; take a glass shade, such as are commonly used for covering artificial flowers, four or five inches deep, and three or four inches in diameter at the mouth; immerse it in a vessel of pure water deep enough to cover it, and turn the mouth downward, taking care to turn the glass under water, so as to exclude the air and leave the interior of the glass wholly occupied by the water. Then put the wax or other substance to be operated on under, that is inside the glass, and apply the focus of the lens to it: globules of air will issue from the wax, and be caught and retained by the glass shade. With this apparatus, in August last, I obtained air globules in abundance from black sealing-wax, rusty iron, dark coloured woollen cloth, dark flint, stone and wood; from lead and white pebbles I obtained a few minute globules of air; but from gold, silver, copper and glass, I could get none, because the gold, silver and copper reflected nearly all the light thrown upon them, and the glass transmitted it. The lens used in these experiments was a double convex, nearly six inches in diameter. With a more powerful lens, I think air would be obtained from gold, silver and copper, or any other substance, except transparent substances, and perhaps from them. The focus made deep pits in the wax, which was rent and torn by the escape of the fluid. The air obtained from all these substances was permanent. It might be retained for any length of time. The nearer the object was to the surface of the water, and the greater was the effect produced by the focus. In most of these experiments, a little of the water was poured out of the vessel containing the apparatus, so as to lay bare the top of the glass shade. The light then had only to pass through the glass, and the water under it to the depth at which the object was placed; which was elevated or depressed at pleasure. The effect was the same, whether the water had been previously boiled or not; but it was somewhat less in sea water than in fresh water.

This is not air liberated from the substances by the action of the light, because air without diminution may be obtained from the same substance, so long as there is light enough to make a powerful focus. Nor is it air from the water, for it evidently issues out of the substances; and if it were from the water, it would come from the gold and silver, as well as from the iron and wax. It is from the light. These facts show, that solar light is air in that peculiar state of action which is or may be called radiation; they show with what facility air in that state of action passes through transparent bodies, and how it penetrates and is arrested by dark coloured substances; and they also show that the effects of the burning glass operating in air, are produced by the combined action of light and air. These conclusions inevitably result from the preceding facts. It seems impossible to resist them.

Moreover, the summits of the tropical mountains, which while smitten by the sun's intensest rays are wrapped in everlasting ice, indisputably prove, that the sun's ray or light alone, will not produce the effect of heat. In all these cases, it is the deficiency of air at the point of action that deprives the sun's ray of its usual power.

Solar light and air, in producing the effects ascribed to solar heat, evidently act in the following manner: the light penetrates substances, and makes way for the admission of air into them; and when the light is sufficiently concentrated, the particles composing bodies are, by the power of those agents, separated and set at liberty, and the

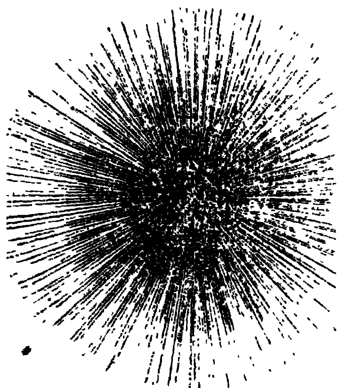
appearances called combustion and liquefaction are produced; an operation, the nature of which is more easily apprehended, when we consider, that the atmosphere is an immense ocean of extremely subtle fluid resting on the face of the earth, in the bottom of which man lives, and all his works are carried on; that it presses with a force of upwards of 14 lb. to the square inch on all objects at the earth's surface; and that it penetrates, permeates, and saturates all solid substances, animate and inanimate, living or being therein. Such, indeed, are the solvent powers of light and air, when their action is combined and sufficiently concentrated, that few things, if any, can resist them.

That light penetrates solid substances, is a truth sufficiently apparent from the foregoing facts; but if further proof were wanting, it would be furnished by the burning glass. It is evident that all the convergent rays pass through the glass; and if the concentrated light from a lens be passed through a transparent phial of water, the cone of light will be seen in the water, and a beautiful sight it is.

And the expansion of [illegible]ated substances is undoubtedly caused by air which has entered them [illegible] which, when they cool and contract, t[illegible]ive out, or squeeze out; and it is the a[illegible]pressed out of cooling bodies that caus[illegible]e ebullition, repulsion, and hissing [illegible]d, when water, oil, or almost any other [illegible]l is thrown upon them. If a piece of [illegible]t iron, or any other red hot substance, [illegible]unged into water, the air which ha[illegible]ente[illegible]it, will be seen issuing from it i[illegible]ible bubbles; which, by the follow[illegible] may [illegible]aught and retained f[illegible]ength of time: take [illegible] vessel of c[illegible]ld [illegible], either from the spring, or of water which has been previously boiled, deep enough to allow a common drinking-glass to be inverted in it without admitting air into the glass; and invert a glass therein accordingly: then raise the inverted glass a few inches from the bottom, and thrust a piece of red hot stone, iron, cinder, or any other red hot substance under it, and the air from the heated substance will rise into the glass and be retained. This proves beyond all doubt, that air issues copiously out of highly heated substances. It also accounts for the expansion of heated substances, and evidently is the cause of their repulsion. Hence it is clear, that atmospheric air, aided by light, and in the form of light, enters into substances, and separates the particles composing them, and is the agent which effects the dissolution of the substances in all cases of combustion and liquefaction, whether it be of metals or other things. This also shows, that the agitation of boiling water is caused by air which comes through the substance of the vessel in which it boils, and not by any conversion of the water into gas, or vapour, or steam; of which truth, the following facts afford further proof. The boiling of water commences by the formation of small bubbles on the bottom and sides of the vessel exposed to the action of the fire, which gradually enlarge and rise to the surface, and others are again formed in their stead, and rise with continually increasing celerity, until they produce the ebullition called boiling. These bubbles are air which comes through the substance of the vessel; and if a common drinking glass be put in a vessel of water sufficiently deep to cover it, and turned with the mouth downward, care being taken to turn it under water so as not to admit any air in the act of turning, and the vessel of water then be put on the fire to boil, the air will gradually take possession of the glass and drive the water out. The operation will be plainly seen by watching the glass. If when the glass is full of air, the vessel be taken off the fire and allowed to stand, the air will escape through the expanded substances enclosing it, rapidly at first, while the expansion is greatest; but more slowly afterwards as the substances cool and contract; and in half an hour or an hour it will wholly disappear. If, however, a portion of the hot water be poured out of the vessel, and the remainder cooled by adding cold water to it; or if the whole of the water in the vessel when taken off the fire, be cooled, by adding cold water to it as quickly as may be without breaking the glass, a portion of the air inside the glass will be retained. The result is the same if milk is used instead of water. The glass fills with air, which escapes in the same manner. I apprehend it would be the same with any other liquid that will boil. Again, if a tin vessel containing water be partially immersed in a vessel of boiling water, the water in the tin vessel may be raised to boiling heat, but it will not boil, because the water in which the tin vessel is immersed interrupts the action of the air. The air penetrates and impregnates the tin vessel and the water it contains, but the surrounding water prevents it passing through in such a current as to produce continued ebullition. It is beyond all question that the ebullition of boiling water is caused by air which penetrates and comes through the substance of the vessel in which it boils.

And, further, to illustrate this theory, to show the sort of action which is continually going on about all fires, and how they produce the effects ascribed to heat, and that those effects are produced by an aërial fluid of which the atmosphere is the source, I may mention an occurrence which came under my observation on the 20th of January 1838.

At noon on that day, the ground being covered with snow about one inch deep, there being a keen frost, a brilliant sun, which made no impression on the frost, a calm atmosphere, (or if disturbed at all it was by breathings from the north-east), and the thermometer standing at 14 degrees Fahrenheit, a brasier of burning coke was placed upon the snow, in the open air, which made upon the ground a radiated figure of this form:—



the dark parts being thawed. The brasier was a circular one, and occupied the centre of the figure. In order to ascertain if the radiation resulted from any local cause, the brasier was removed into different places, but it produced in all of them the same figure. On the 28th January, 1839, the experiment was tried again with coal instead of coke, the ground being covered with snow about half an inch deep, there being a keen frost with a sky perfectly overcast, and a gentle breeze from the north-west, the thermometer standing at 31 degrees Fahrenheit, when the same figure was made upon the ground. The radiation in this figure clearly indicates the action of an aërial fluid forcibly emitted in all directions from the fire. The figure is made by an action of the atmosphere, which may properly be called radiation. It is this action which produces the effects described to the heat of the fire. Air which has performed the office of combustion, and the light and airy particles of matter which it has liberated, are immediately displaced by the pressure of the surrounding atmosphere; and this pressure, combined with the cohesive attraction of the heated and burning substances, appears to be the cause of the action indicated by the figure.

Solid substances may be impregnated with air by friction and compression, and both solids and liquids, by the radiation described in this figure. And a substance so impregnated immediately begins to radiate, and will impregnate any other substance within the sphere of its action. This is the nature of the action by which the fire burns. This radiation is the subtle action of a subtle fluid in a homogeneous fluid; of air in air; which is the reason why it is invisible.

That the distribution of the atmosphere over the earth's surface, is effected and regulated by the earth's rotation, is the necessary consequence of the natural arrangement of matter. The atmosphere being a fluid resting on the face of the earth, and the earth being a sphere turning with great velocity on its axis, the centrifugal force arising from the earth's rotation will inevitably cause an accumulation of atmosphere at the equator, which, under the influence of the same force, will gradually decline towards the poles.* And a certain consequence of the accumulation will be an increased density at the equator, which likewise will gradually diminish with the accumulation from thence towards the poles. This distribution of the atmosphere results from the order of nature. And that such an atmospheric accumulation and density at the earth's equator does exist, is proved by the fact, that within the tropics, the barometer does not descend more than half as much for every 200 feet of elevation, as it does beyond the tropics. The retardation of the pendulum, and the decrease in the intensity of gravity, in the equatorial regions, are also attributable to the increased density of the atmosphere in those regions, and not to the earth's centrifugal force, (further than that force increases the atmospheric density there), nor to any diminution of density. Bodies fall or move with more facility and speed in vacuo than in air, because all resistance to the moving body is removed; through air than through water, because the air offers less resistance than the water; and it follows as a necessary consequence, that they move with greater facility in rarified than in dense air; and that the resistance to the motion of bodies increases with the density of the atmosphere in which they move. I refer, therefore, to the equatorial retardation of the pendulum and decrease in the intensity of gravity, as additional proofs of an accumulation and increased density of atmosphere at the equator. But to my mind the dip of the magnetic needle affords still stronger and more striking evidence of this arrangement of the

* The waters of the ocean, under the influence of the earth's centrifugal force, are known to be elevated at the equator. That seems to be the power which obeyed the Almighty fiat: "Let the waters under the heaven be gathered together." That appears to be the power which first established and still maintains the level of the sea.

atmosphere. From the equator towards the poles, the dip gradually increases. Suppose, then, that the density of the atmosphere, at every step in the same progress decreases, and we have the reason for the increased dip in the diminished density of the atmosphere, and the diminished resistance consequent thereon. The dip increases as the resistance to it diminishes. And, further, the attractive power seated in the earth, which causes the needle to dip, (and which seems to be an induced attraction), combined with this distribution of the atmosphere, will give to the needle a general polarity. It must necessarily point in the direction were it meets the least resistance. And, moreover, according to these views, there ought to be a complete terrestrial circle in each hemisphere, somewhere short of the terrestrial axis or pole; namely, in that latitude at which the earth's centrifugal force ceases to produce an accumulative effect on the atmosphere, throughout which circle, allowance being made for local influences, the magnetic needle will attain its greatest dip, and not be confined to any point or pole, or small locality. And I think I may be allowed to say there is reason to suppose that such a circle in each hemisphere does exist.

The preceding facts are submitted as evidence of an atmospherical accumulation and density at the equator. Any proof of the extreme intensity of solar light in the equatorial regions is unnecessary, that being a fact well known and universally admitted. We have then, such an arrangement of atmosphere and solar light, as proportions the degree of solar heat, at any given point, to the intensity of the light and the density of the atmosphere at that place; and as gives just such a distribution of natural heat, as, with the exceptions presented by the Hymalayas, is found to exist. According to this theory, the heat would be greater and ascend highest within the tropics, where the light is most intense, and the atmospheric accumulation and density are greatest; and from thence, its elevation would decline and its intensity decrease, towards the poles. And that is the order we find in nature. We have the greatest heat, attaining the highest elevation, within the tropics; which, with the exceptions referred to, from thence gradually decline and decreases in intensity towards the poles.

The anomalies of the Hymalayas may be perphaps be adduced against these views. Those anomalies, however, appear rather to confirm than weaken them. They are of that class of exceptions which prove the rule. This range of mountains, situate between 28° and 36° north latitude, extends in one continued chain from 67° to 97° east longitude; a distance, including sinuosities, of about 2000 miles; presenting throughout that immense range, a barrier towards the north of the mean height of 17,000 feet. And that is but the average elevation of the ridge, from which rise numerous lofty peaks, some of which attain upwards of 26,000 feet, and but few of them rise less than 20,000 feet above the level of the sea. On some parts of these mountains, the inferior line of perpetual congelation does not descend lower than 17,000 feet above the level of the sea; whereas the inferior line of perpetual congelation at the equator is only 15,500 or 15,700 feet above that level. But the most remarkable, and to our purpose by far the most important of those anomalies is, that the heat and the inferior line of perpetual congelation appear to attain a higher elevation on the northern than on the southern side of the Hymalayas. At least that inference may be fairly drawn from the fact which seems to be well established, that the extreme height of cultivation on the southern slope of these mountains is 10,000 feet, the height of habitation 9,500; while on the northern slope villages are found at 13,000 feet and cultivation at 13,600 feet. Now the earth's rotation and centrifugal force will necessarily cause and at all times keep up a strong bearing or pressure of atmosphere from the poles towards the equator, which coming in contact with the immense barrier presented to it by these mountains, will force up and compress and condense itself by its own momentum against the northern side, and thus produce the existing anomalies.

With regard to heat from compression of air, it is well ascertained, that the temperature or action of atmospheric air is proportioned to its density; increasing where the density increases, and diminishing where it diminishes; and that its density is increased by compression, whether the compression be effected by mechanical means or by the superincumbent weight of the atmosphere itself. Hence the reason why the temperature or action of the atmosphere diminishes as we ascend from the earth's surface. Air, by sudden compression, is made to ignite combustible substances. The temperature at the bottom of deep mines, is greater than at the top. The deeper the mine, the greater the heat. This, with great deference I submit, is caused by the superincumbent pressure of the column of air which descends the pit. Proceeding from the poles to the equator, the temperature of the atmosphere increases. Ascending from the earth's surface, it decreases. We know that the density of the atmosphere decreases as we ascend from the earth's surface; and we have seen that it increases as we approach the equator.

By compression, air also gives light or becomes light; that is, it produces the effects ascribed to light. The heat and light from percussion are caused by the compression of air in the pores of the substances. All solid substances immersed in air, become thoroughly saturated with air. The subtilty of atmospheric air, aided by the pressure of its own mass, would alone enable it to penetrate and permeate all solid substances at the earth's surface; but in this operation it is materially assisted by the action of light, as the preceding experiments on light clearly show. Solid substances immersed in water, which is a much less subtle fluid than air, soon become saturated. Water will saturate wood, iron, stone and perhaps any other substance permanently immersed in it. It is evident therefore, that the violent collision of substances causes a sudden compression of air in the parts coming in contact; which is greater or less, according to the elasticity or flexibility of the substances used. Stone and iron in collision, being hard and rigid substances, give out sparks. The common kinds of wood, being softer, do not. It is difficult to give one proof of these views which is desirable, namely, the collision of substances in vacuo. It is not an easy matter to maintain a vacuum for such a length of time as to allow an experiment like this to be properly made. In order to try the experiment satisfactorily, the substances to be struck should lay in vacuo for some time before the collision, in order to extract, as far as possible, the air out of them. Another and a better proof, is to strike the substances in water, which not only displaces the air from the outward surface; but in some degree follows it into its retreats, the pores of the substances, and drives it out. This will give convincing evidence, that neither light nor heat can be obtained by percussion in the absence of air.

Heat from friction also is caused by the compression of air in the pores of solid substances; the compression being effected by the action of the substances in air. The axles of machinery would not heat if the air could be excluded from them. Perhaps, the nearest approach to a perfect exclusion, is to make them run in liquids. By friction in air, substances may be heated red hot; but they can neither be heated red hot, nor heated in any considerable degree, nor, I think, heated at all in water by friction, because the air is excluded from them.

In the case of friction, the compression of the air commences in the superficial pores, and is gradually extended throughout the mass. But there is a case of heat from compression of air, in which the compression and heat commence in the interior of the substance, and the heat comes principally if not wholly from the inside, that is, out of the mass of the substance. This is the case when a piece of iron is hammered until it is hot. The iron being saturated with air, the air in the iron is compressed by the compression of the iron, effected by the hammering; and hence the heat. Of this kind, was the heat Count Rumford obtained by boring cannon in water, if indeed the heat he obtained did come from the boring; that is, from the shaving or cutting of the iron; but from the length of time occupied in that experiment, (two hours and a half if my memory be correct,) and the degree of heat obtained, (boiling heat) it is possible that some portion of that heat might be caused by the action of that part of the machinery which was out of the water, and be communicated from thence to the water. The boring of cannon, however, is an operation requiring great force, and possibly the heat might arise from the compression of air in the iron, effected by the shaving or cutting.

From this kind of heat, the illustrious Newton might come to the conclusion, that heat consists in the internal motion of the particles of bodies. There is an internal motion in bodies when they emit or give out heat, either from compression or from any other cause. It is the motion of the air within them; which more or less communicates itself to the particles, and so the particles may be said to move, and the effect might be ascribed to their motion. Hence too, as well as from other sources that eminent philosopher, Dr. Black, might conceive his theory of latent heat. He supposed the existence of something in bodies, which under some circumstances was evolved, or set free, and produced the effects ascribed to heat; and which he called latent heat.

The heat in many, if not in all cases of spontaneous combustion, seems to arise from the compression of air; the compression being effected by subsidence and the contractile and accretive properties of the substances.

The light arising from percussion and friction also affords evidence, that atmospheric air, under some of the many modifications of which it is susceptible, becomes light. The radiation of atmospheric air, always produces more or less of the effects ascribed to heat; and if the action be strong enough, it also produces the effects ascribed to light; that is, it makes things appear, or becomes the medium whereby they appear. Electrical light, and all artificial lights, are but modifications of atmospheric air. And all electrical effects appear to be produced, principally if not wholly by the action of the atmosphere.

I fear to trespass further on your valuable columns, or the sea and land breezes which in

these latitudes prevail in the summer season, the east passage winds and the monsoons may all be accounted for, and I think, satisfactorily explained, on the principles laid down in this paper.

I am, Sir, your's with much respect,

W.



ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM BEDFORD, OF HINCKLEY, LEICESTERSHIRE, FRAME-WORK KNITTER, *for certain improvements in machinery employed in manufacturing hosiery goods, or what is commonly called "Frame-work Knitting."* Petty Bag Office, March 17, 1841.

A bar extending horizontally through the machine, and connecting the front pair of standards together, is called the main bar, in front of which a presser bar is fastened by screws. A series of barbed needles of the usual form, set in leads, are mounted upon a horizontal bar, attached to two end trucks, which run to and fro upon bed plates, constituting a carriage, by which the needles advance or recede.

A series of jacks are mounted on a fulcrum rod, in a comb fixed on the stationary jack-bar, which is supported upon transverse bars connected to the back and front standards. From each of these jacks a "sinker" is pendant. A number of thin curved metal plates, which the patentee calls "dividers," are fixed to a bar which is screwed to the main bar between it and the presser bar; these "dividers" are employed in lieu of the lead sinkers usually employed. The thread is wound upon a bobbin placed conveniently above the machine, from whence it is led off by a carrier, which traverses in the front of the machine.

The use of the presser bar, is to close the heads into the eyes of the needles while receding, which is effected by the needle carriage rising at the proper time over a small elevation on the bed plate: by which means the heads of the needles are brought up against the under edge of the presser bar. In the receding movement of the needles, while their beards are held down by the presser bar, the stitches of the preceding work are slid over the depressed beards, and by the time the needle carriage has reached its farthest receding point, the stitches have been drawn over the heads of the needles, and made to embrace the loops under the beards in the heads of the needles, and thus to form of these loops a new series of stitches, or range of work.

WILLIAM COOPER, OF LAYHAM, SUFFOLK, IRON-FOUNDER, *for an improved method of constructing thrashing-machines, and other agricultural instruments.* Enrolment Office, March 21, 1841.

These improvements, if such they be, consist in the application of a lever and cranks to give motion to thrashing-machines, chaff-cutters, and mill-stones.

The thrashing part of the machine is constructed in the usual manner; but to one end of the shaft which carries the beaters, is attached a pinion, driven by a drum-wheel fixed on an axis that extends through the machine, having at its other end a fly-wheel. The fly-wheel and drum have each a dip or crank, which are connected by levers to a horizontal beam above the machine; the cranks are opposite to each other, so that while one is up the other is down. The levers being pressed upon by men, or acted upon by horses, communicate motion to the cranks and drum-wheel, and thereby to the machinery to be driven.

The claim is, 1. As an improvement in the thrashing-machine, the application of the lever to the drums and fly-wheels (whether worked by horses or by men) so as to set the beaters in motion by the power derived from the lever.

2. As an improvement in the chaff-cutting machine, the above mentioned application of the lever, so as to set in motion the wheel on which the knives are fixed.

3. As an improvement in the mealing-mill, the above mentioned application of the lever, so as to set the mill-stones in motion.

SAMUEL DRAPER, LATE OF NOTTINGHAM, NOW OF TIVERTON, DEVON, LACE MANUFACTURER, *for improvements in the manufacture of ornamented twist lace and looped fabrics.* Enrolment Office, March 21, 1841.

These improvements are, first, in the means of working the warp threads of twist lace machinery in order to their each being independent of the others, and that the manner of working each warp thread may be governed by suitable pattern surfaces. In the machine for this purpose, four warp thread bars are used; two to work the front, and two to work the back warp threads. These threads are selected by the following contrivance: they pass through what are termed beads, placed horizontally, to each of which two threads are affixed; one of the threads passes over a bar and terminates in a weight, the other passes through a stay, and terminates in a sliding bolt. This bolt passes through holes in a plate, and rests on the pattern surface of the Jacquard cylinder. There are the same number of beads as of warp threads, the front and back warp threads passing alternately through succeeding beads. By the rising or falling of the sliding bolts on the elevating or depression of the pattern surface of the Jacquard cylinder, the

beads, and by them the warp threads, are actuated.

2. A mode of working the warp threads of warp lace machinery by applying two warp threads to each needle, when the same are caused to leap on to the needles by independent instruments, each governed in its movement by proper pattern surfaces. This is an improvement on warp lace machinery as formerly patented in 1837 by the present patentee. The lever guides have each two eyes, or openings, through which the threads pass, and which they lap on two different needles, by which means two threads are lapped on each needle.

3. A mode of moving the warp threads of warp lace machinery in order to the warp threads being more conveniently governed in their movements and separately selected and varied in their manner of leaping from time to time on the needles by means of suitable pattern surfaces.

This apparatus is very similar to that first described, for working the warp threads of twist lace machinery, and consists of a series of beads, placed vertically, one to each needle; the beads are attached to small weights and to sliding bolts to be acted on by the pattern surfaces. The threads are lapped by a "lapping point bar," having a row of cranked points equal in number to the spaces between the needles, by means of which the warp threads are held right for lapping.

Lastly, to an improvement of his former invention relating to warp lace machinery (patent of 1837), in which independent guides were caused to work, by being selected by pattern surfaces, and each guide worked with a single warp thread, lapping on two needles; but in this instance the threads, when lapped on the two needles, are pressed and looped upon only one, for which purpose the patentee applies a point—bar having as many points as there are spaces between the needles. This point—bar is suspended so as to work up and down with the sinker frame; but in addition to this movement it has a cam, to lift the points out of the needles when the lapping is taking place, and to allow the points to descend when the lapping has been performed, by which means the thread lapped across the two needles will not be passed under the beards of both, but only under that of one needle.

The claim is, 1. The mode of actuating the warp thread of twist lace machinery. 2. The mode of applying two warp threads to each needle by means of independent instruments. 3. The mode of actuating the warp threads of warp lace machinery by independent instruments and apparatus. 4. The mode of working with single threads to each of the needles by means of independent instruments, worked by pattern surfaces, when lapping on two needles, by causing the thread so lapped on any two needles to pass only under the beard of one needle.

James Lee Hannah, Doctor of Medicine, of Brighton, *for an improvement or improvements in fire-escapes.* Rolls Chapel Office, March 23, 1841.

We have searched this specification, (which occupies twelve skins of parchment), without being able to discover either "improvement or improvements." The patentee states that the fire-escape in its whole, and in its component parts, is applicable to other purposes besides resquing persons and things from fire. We must beg leave to doubt its application to any useful purpose. It is composed of a ladder formed of a multitude of sections, some ten feet, and others 5 feet long—an elevator—a lifter—a remover—a safety box—revolving poles—wheels—ropes and blocks and pulleys. The sections are all capable of being united into one ladder, with parallel sides 16½ inches apart. The spokes are to be of the best oak turned, the sides of the ladder of the best yellow deal or other suitable wood, 4 in. by 2½ inches. The spokes are about 9 inches apart. To the extreme ends of all the sections, where one butts against the other, a flat piece of sheet iron is applied, called the end plate; the sections are conected to each other by means of plate-bolts, eye-bolts, screw-bolts, eye-bolt-plates, and screw-bolt-plates. The ladder is composed of 3 ten feet, and 6 five feet sections, so as to be capable of reaching, when joined up, to 60 feet. The top-joint or section of the ladder is fitted with wheels, in order to pass over any slight obstruction in the ascent, but where balconies, verandahs, and such like impediments occur, *they are to be broken down!* None but the most skilful men are to be employed to apply this escape, and they are to be well trained. They must also be strong as well as skilful men, the ladders weighing upwards of 4 cwt., without the appendages. The claim is. 1. To the manner of connecting together the sections or portions of the ladder. 2. To the application of the remover. 3. To the application of the elevator. 4. To the application of the revolving poles. 5. To the application of the safety box.

The exact size of every screw, bolt, hole, plate, &c., throughout the apparatus, is given with the greatest minuteness, but any thing so palpably absurd as the whole thing could hardly at this time have been imagined; there is not a single novelty in any one part, while the complication and cumbersome character of the apparatus would assign it to the period of the James' or the Charles'.

Pierre Erard, of Great Marlboro'-street, *for improvements in pianofortes.*—Enrolment Office, March 23, 1841.

These improvements are various, and may be applied either to upright or horizontal piano-fortes. The first is an improved action, for upright piano-fortes; an intermediate lever is introduced between the key and the hammer, as described in specification of the original patent of December, 1821, which patent was extended in December 1835. Upon this intermediate lever a sticker is mounted, and there is a regulating screw in front of the action, to effect the escapement of the end of the sticker from under the hammer, when the other end comes up, which being placed in front of the action, is very easily got at, and admits of being duly regulated without taking the action of the instrument out of the case, as is necessary in the ordinary construction. Behind the centre of the intermediate lever, it is prolonged upwards to form a short elbow lever arm which acts against the lower end of a damper, which is fixed in its centre of motion, and that centre is sustained by the hammer rail properly shaped to receive it. The upper end of the damper acts on the strings by means of a spring. This new contrivance, in deriving the motion of the damper from the short arm of the intermediate lever possesses an advantage over the former mode of actuating it by the long end of that lever, proportionate to the difference of the length from one centre to the other.

A long bar of metal extends horizontally across the row of dampers, and is suspended on hinge joints, being so contrived as to act against the lower ends of the dampers, in order to take off their upper ends from the strings at pleasure, by means of a pedal, in order to effect the *forte*. The mode of arranging the dampers when the strings are placed obliquely in the instrument, is shown.

In pianofortes having the strings placed vertically, both the damper and hammer to each note must range in the same vertical line, which in such cases is the centre line of the strings for that note; the dampers in that case being upright, and their heads ranging immediately under the hammer heads. An improved mode of strengthening and consolidating the action frame is described at length.

An improved mode of constructing the centre-pins for the keys, is as follows:— The lower part of the pin which screws into the key-bed, and stands up therefrom, is formed into a ball, and a cup or socket to correspond is formed in the wood of the key on its underside. The ball is formed true by turning it in a lathe; the socket is made with a bit, of a suitable size and form. On the top of the hemisphere, an oval shaped pin stands up to fit into the mortice through the key, in order to keep the key laterally in place on the hemisphere. The inside of this mortice is lined with thin cloth, or other soft substance, and when so lined, the mortice is a little wider than the least breadth of the oval pin, but rather narrower than its greatest breadth, in order that the oval pin being turned round a little way be brought exactly to fill up the width of the lined mortice, so as to make the motion of the key sufficiently steady to prevent rattling.

In like manner, in order more effectually to prevent such defect of rattling, oval pins are also applied for the guide pins in front of each of the keys, which stand up from the key bed.

A new and improved action for pianofortes of a horizontal construction is next described, applicable to grand and semi-grand, as well as to square pianofortes. It takes up less room in height than the common grand action, or than the grand action which formed part of the patent of 1821. The merits of this action consist in the employment of the intermediate lever and elbow sticker as first described.

This is followed by an improved method of applying the metal plate which carries the hitch-pins for the ends of the strings or wires of pianofortes in general. A number of metal brackets are screwed on to the wood frame of the instrument, in order to sustain the string metal plate, which is fastened to them instead of to the wood; these brackets being made sufficiently strong to prevent the metal plate from tilting over, and bending the wood by the great strain of the strings, the ends of which are hitched on hitch-pins fixed in the string plate.

The next is an improved form of stand or supporting legs, applicable to all pianofortes which stand horizontally, and especially to those which rest with four feet on the floor. These legs consist of two scroll pieces which, when put together, resemble a letter X laid sideways, thus — 8 . The lower ends of two of the feet rest upon the floor, while the upper ones support one end of the instrument; the other end being supported by a similar pair of such parts.

The two pieces of each pair are united together by a centre joint, so that all four of the feet will bear equally upon the floor, and thereby equally sustain the weight of the instrument, whatever may be the unevenness of the floor. The centre joint by which the two pieces are united, is formed by two metal plates inlaid laterally into the substance of the upper and lower parts of the frame at each side thereof, and are strongly fastened to the lower part by screws; through the two plates a long screw-pin passes, its head being sunk flush into the outermost of the metal plates: the other end of the screw

enters and screws into the end of a long horizontal rail, extending under the whole length of the pianoforte, to connect the two ends of the frame together, and make a firm stand. This rail also serves to steady a lyre or frame, which sustains the centre of motion for the pedal.

The claim is, 1. The sticker or elbow lever as applied to the action of upright pianofortes, being mounted on the intermediate lever, together with the regulating screw, and the rail by which it is supported, in order to effect the escapement of the lever from under the hammer.

2. The damper, as constructed and applied, to be actuated by the short end of the intermediate lever, which end is at the opposite side of the centre of that lever, to that end thereof which carries the other or elbow lever.

3. The construction and application of the plate and crank, for removing these newly contrived dampers from acting on the strings.

4. The metal connecting plates for uniting the several horizontal rails of the action frame together, and the projections for uniting with the key bed. These four improvements being applicable to upright pianofortes, whether the wires range vertically or obliquely.

5. The ball and socket centre of motion for the finger keys, and with the lining of the mortice through the key, and the oval-shaped pin applied on the top of the same centre ball, in order to fix that lined mortice as it wears wider; likewise the lining of the hole at the front end of the key, which improvement, though simple, will be found of great importance. Because pianoforte keys constructed in the improved manner, will last much longer without requiring repair, to remedy the very unpleasant defect of rattling.

6. The application and combination of the different parts of the action, formed by so combining those parts as a portion of the present invention.

7. The new brackets and mode of fixing the metal string-plate on the wood work of pianofortes, whether standing upright or horizontally.

8. The new frame for supporting horizontal square pianofortes, and obtaining an equal support by all their four feet, notwithstanding unevenness in the floor on which they stand, or want of flatness in the instrument.

ALEXANDER DEAN AND EVAN EVANS, OF BIRMINGHAM, MILLWRIGHTS, *for certain improvements in mills for reducing grain and other substances to a pulverised state, and in the apparatus for dressing or bolting pulverised substances.* Rolls Chapel Office, [illegible] 24, 1841.

The nature of these improvements, which are most elaborately particularised at great length, and illustrated by eighteen sheets of drawings, are very well epitomised in the following claims.

We claim, firstly, the method of constructing grinding surfaces on plates, with a plain or smooth portion in addition to the usual or grinding surface of the plate: the use of this plain part surrounding the grinding part is to prevent injury to the grinding surfaces of the plates by their being set too close together, and this plain portion of the grinding plate serves also to rub and comminate the substances which have not been sufficiently ground. We also claim the exclusive use of grinding surfaces or plates formed of earthenware or porcelain, but we prefer the grinding surfaces or plates formed from similar materials to those used in fabricating the mortars well known as Wedgewood's mortars, and which are in common use; the peculiar combination of materials of which the Berlin ware is composed, also answers extremely well when formed into grinding surfaces. And we claim the exclusive use of grinding plates formed from such like materials. Metal grinding plates oxydise and then give a bad colour to those substances which are ground between them, they are therefore not adapted to grind salts which deliquesce, or loaf sugar, while the plates formed from the porcelain earths are not acted upon chemically, and have sufficient strength of cohesion to withstand the operation of grinding. We claim the employment of such materials in constructing large or small stones in lieu of French burrs.

And, secondly, we claim as our improvements in apparatus for dressing or bolting pulverised substances the use of a spiral brush, which, while it forces the pulverised substance through the interstices of the wire gauze trough in which it works, at the same time conveys or forces the substance to be dressed or bolted over the upper surface of the wire gauze trough, or forces it through the interstices of the gauze, thus obviating the necessity of placing the bolting or dressing apparatus in an inclined position.

We claim the dressing and bolting apparatus constructed with a spiral brush, whether in combination with a mill, or used as a separate apparatus.

THOMAS MUIR AND JOHN GIBSON, OF GLASGOW, SILK MANUFACTURERS, *for improvements in cleaning silk and other fibrous substances.* Enrolment Office, March 24, 1841.

These improvements relate to the cleaning of silk waste, more particularly that known in the trade as "foul silk waste,"

after it has been converted into the form of sliver or rove, and reeled into hanks; the rove being preferred. This, when reeled into hanks, is immersed in water until it is completely saturated; the hanks are then well wrung, which is most conveniently performed by means of an apparatus used by dyers, called a "wringing post." This post has an arm or arms fixed to it, on which the hank or hanks are flung, and the operator by means of an instrument called the wringing pin, can easily give the silk the requisite degree of wringing, which should be continued until the water ceases to run from it.

The hanks are then to be well scutched by means of the same apparatus. This saturation of the silk with water, together with the wringing, has the effect of making the finer fibres of silk adhere to each other more closely, while the scutching, without disturbing the natural adhesiveness of the fine fibres, throws out, or partially detaches, the nibs and the coarse and unequal filaments of silk from the body of fine fibres of which the rove is principally composed. The silk waste is next dried and wound on bobbins ready for the subsequent process. By thus submitting silk waste to the preliminary process of wetting, wringing, and scutching, it is put into a form by which is materially facilitated the operation of the machinery to which it is next to be submitted. The rove is sometimes submitted to the succeeding operation in the wet state, although it is stated that in most cases it is preferable to do so after it has been dried. The same preliminary processes are also applicable to slivers and rovings made from silk waste combined with wool, flax, or hemp.

The bobbin containing the silk thus prepared, is placed on the delivery spindle of the cleaning machine. In a groove upon a flange of this spindle, a cord is placed fixed at one end, and having a weight attached to the other, so as to regulate the resistance to the revolving of the bobbin; this cord is called a tempering band. From this bobbin the rove is wound on to the taking up roller, passing in its progress a revolving cylinder covered on its surface with cards, which effects the cleaning of the rove. The cards are kept continually in a clean state by a "stripper."

The form of cards said to be best for covering the cylinder for this purpose, is that termed fillet, from an inch to an inch and a half wide, and the teeth made of "sectorial wire from No. 19 × 23. Instead of using the carded roller, a cylinder with a series of spiral blades round its circumference, may be employed in connection with a straight-edge, similar to a shearing machine. But in this case, instead of dragging out the protruding or unequal parts of the roving, they will be cut out. The patentees give a decided preference to the carded roller for the purpose. They do not confine themselves to any precise arrangement of machinery, so long as the general character of their invention is retained, but claim the mode herein described of cleaning silk waste, and silk waste combined with wool, or hemp, or flax.

John Johnston, of Glasgow, Gentleman, *for a new method (by means of machinery) of ascertaining the velocity of a space passed through by ships, vessels, carriages, and other means of locomotion, part of which is also applicable to the measurement of time.* Enrolment Office, March 24, 1841.

This new method consists in the application of a suspended weight or secondary governor, to the lever or balance immediately connected with a watch escapement, or to the balance of a chronometer, so that this weight, by means of locomotion, may increase the number of the vibrations. Two weights are suspended freely upon pivots, a short distance from each other, from which rise two perpendicular rods; a smaller single weight is supported between the two upright rods, by slight hair springs. The use of the two larger weights is to support the central or principal weight, and also to maintain its power upon the watch or chronometer during any disturbing movement in the locomotive body to which it may be attached.

In applying this suspended weight to a watch or chronometer, the balance thereof must be neither of too large, nor too small a compass. In attaching the weight, it must be fitted to the balance exactly, so that it will influence the going and returning of the balance equally. The effect of this suspended weight, by the natural resistance of any body to motion, will be, that the rate of the watch or chronometer will be accelerated in some definite degree, according to the velocity of the moving body or vehicle. Thus if an increased rate of 2 seconds is gained for one mile, in respect of proper mean time, 4 seconds will be gained by 2 miles; or if 4 seconds is gained by one mile, 8 will be gained by 2 miles, and so on.

A watch showing proper time must also be used in conjunction with the above, so that the minutes and seconds gained over proper time by it, may be known. This may be a new and useful invention, but we confess it passes our comprehension.

William Hirst, of Leeds, Clothier, *for improvements in the manufacture of woollen cloth, and cloth made from wool and other materials.* Enrolment Office, March 24, 1841.

These improvements relate to certain modes of fulling and milling cloth made of wool, or wool combined with other fibrous

materials, which will felt together, or not prejudicially interfere with the felting properties of wools, this invention relating more particularly to that description of cloth which is produced, and milled or fulled without the fibres being first spun into yarn and then woven; that is, simply taking advantage of the properties of such fibres interlocking and matting, called felting, by motion of the fibres amongst themselves. But part of the invention relates also to the fulling and milling of cloths of wool, or wool and other fibres which are made into yarn, and then woven into fabrics. In manufacturing cloth from wool alone, or combined with other substances, when the processes of spinning and weaving are dispensed with, the object is to produce a uniform and even fabric of the thickness required, possessing sufficient coherence to undergo the subsequent processes of fulling, milling, &c. The mode of producing this fabric, in the first instance, is not claimed in this patent, although the patentee fully describes the mode which he prefers for the purpose. An ordinary scribbling machine is employed, with an enlarged roller, upon which a number of slivers are wound in succession, until a sufficient substance is obtained; the patentee states that 46 layers of sliver makes a very strong cloth. The proper thickness of bat having been thus obtained, it is taken off the roller by dividing it, a number of these pieces are joined together by combing out the edges of the ends of such sheets, and laying them together, so that the ends of the two sheets may lap over each other two or three inches, and be pressed together. When a sufficient number of sheets have been joined together to produce the length required, they are wound on a roller and carried to the machine for performing the first part of the fulling or milling process, by compressing the fibres amongst each other, and so cause them to interlock or mat, and the sheet of fabric to be strengthened. A press is employed for this purpose, the bed and platen of which are two large hollow surfaces, to which steam is admitted, so as to keep them in a heated state, one end of the bat being placed in the press, the screw is turned, and the upper plate brought forcibly down upon the fabric, which is thereby pressed and milled; the screw being raised, the pressed part of the cloth is wound upon a taking-up roller, and a fresh portion laid in the press, and so on till the whole is transferred from one roller to the other.

In the second process, the cloth being covered with a piece of calico, is wound tightly upon a roller and placed in the trough of a fulling machine; this trough has a false bottom perforated with holes, and a partition on one side down which a steam-pipe passes to beneath the perforated bottom. A plank of wood is brought down upon the cloth roller by a strong screw, while the fabric is slowly wound off this roller on to another at the upper part of the apparatus. The combined action of the steam, and the pressure upon the fabric, causes the fibres to intermat and felt, and the cloth to full and mill, and so to become ready for undergoing the ordinary finishing processes. The screw press is preferred, but other similar mechanical means may be adopted. Covering the fabric with a surface of calico, or other smooth even fabric, is said to be highly advantageous to the operation.

The claim is; 1. To the mode herein described, of conducting the milling and fulling process on fibres fabricated into sheets, as described.

2. The mode of carrying on the process of milling and fulling cloths of wool, or of wool and other fibres, as described in the last process.

NOTES AND NOTICES

Expansion of Steam.—Sir,—I beg to thank "M. H. W." for his polite reply to my enquiry respecting the expansion of heated Air (No. 903 and 906). Should "M. H. W." not consider me troublesome, perhaps he would have the goodness briefly to state the laws of expansion of vapour (steam), when *not* in contact with water. I am, &c., A Reader, B.

Immense Expenditure of Gunpowder in Blasting.—In cutting through the Bishop's Lane Ridge, of the Glasgow and Greenock Railway, no less than three hundred tons of gunpowder have been used in blasting by the miners engaged in that operation.

Hemp made from Hop Bine.—The bine of hops boiled in lye till the rind separates freely, may be stripped, and when cool, worked like hemp. This is best done by carding, which makes it like cotton.

Chinese Weights.—A very curious and interesting experiment has recently been made at the Royal Mint, in the presence of its principal officers. A set of Chinese weights, perhaps the first ever exhibited in this country, was compared with the English standard, and the results were found perfectly to correspond with similar comparisons made in China, nearly a century ago, by the missionary Duhalde, of scientific memory.

Holy Trinity Church Clock, Hull.—It is now upwards of six months since this clock was put in motion with its four faces. Its going is admirable, and its having encountered all kinds of weather during the storms of the late winter without any material alteration in its [illegible] fully proves the efficacy of the artist's (our worthy townsman, Mr. Harrison), new plan of [illegible] the pointers of large clocks. There is not, we believe, another clock in the world with four dials of equal magnitude—being upwards of 12 feet in diameter, and each pair of pointers weighing above half a hundred weight. The rate of the clock, which has been regularly ascertained by transit observations from the observatory at the Grammar School—is quite equal to that of the clock at Christ Church, or the one at St. James's, which were both made by Mr. Harrison. We may, therefore, say, that we have at least three public clocks in Hull, which, for accuracy in time-keeping, are equal to any in the kingdom.—*Eastern Counties Herald.*

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; and W. Campbell and Co., Hamburgh.

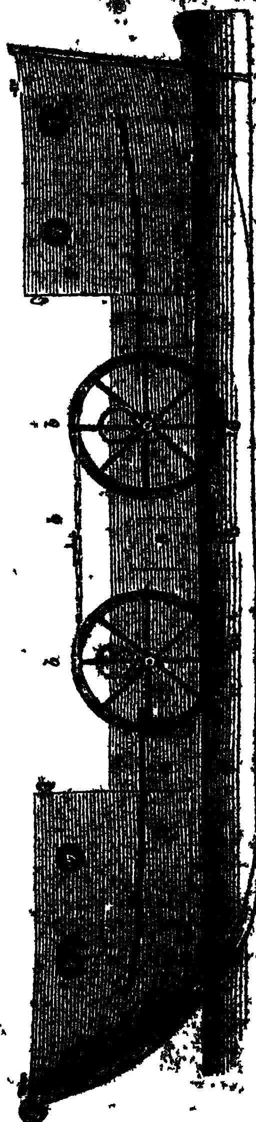
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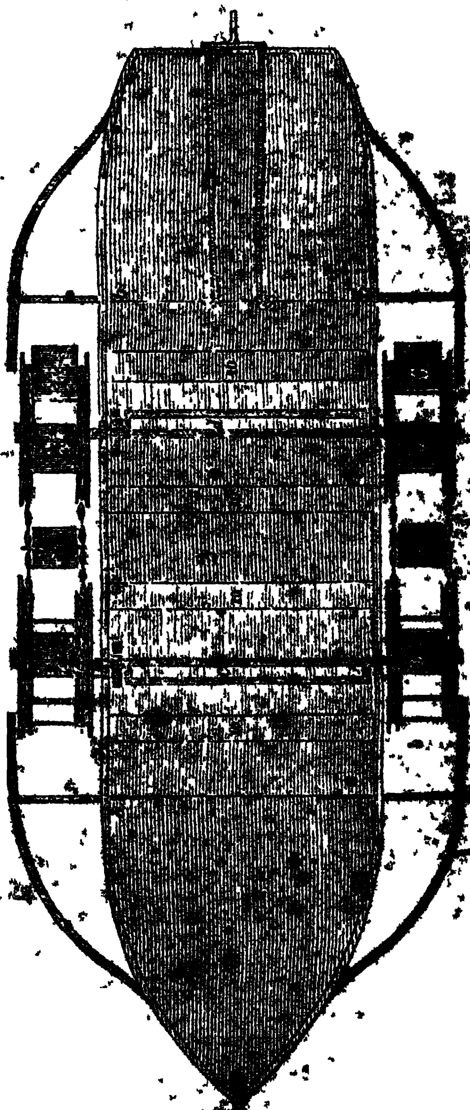
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 922.] SATURDAY, APRIL 10, 1841. [Price [illegible]

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

SALT'S SAFETY LIFE, PILOT, AND FERRY BOAT.





SALT'S SAFETY LIFE, PILOT, AND FERRY BOAT


Fig. 3

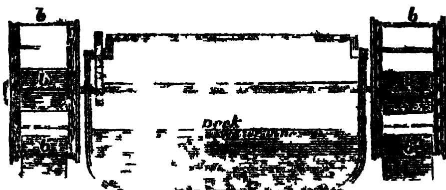


Fig 4.

0 1 2 3 4 5 6 7 8 9 10 Feet 20

SIR,—It is now about eight years since the accompanying plan was drawn up, since which, business has prevented my further prosecuting the design Having just found it with some others amongst my papers, I now send it to you without any alteration, although I am aware that much improvement has taken place in "*Life Boats*" since I applied my attention to the subject An *elastic stern*, &c , improved mode of *confining the air* to prevent sinking, &c , would, perhaps be better, but as it is, I beg to submit the scheme to the judgment of your readers

I am, Sir, yours &c.

SAMUEL SALT

Shrewsbury 9 High-street March 1811

Description of Engravings

Fig 1 is an elevation, and fig. 2, a plan for a safety, life, pilot, and ferry boat Fig 3 is a cross section at the lines *a a* or *b b* Fig 4, a section through the wheels, paddles, and cranks

5 5 5 5, are hanging doors to let off the water which breaks over the bow of the boat.

6 6 6 6, iron paddles, which work with the surface in the water perpendicularly, and horizontally when not immersed

7 7 7 7, are glass lights to cabins, 8, the cabin door made water tight

9 9, are the air-valves, 10, ten seats for the men who work the cranks and paddles

The boat is 30 feet long, and 7½ feet wide, one of greater length and breadth would be better for a rough sea, as the height of the boat would in each case be the same The boat must have sufficient ballast to sink it at least 18 inches in the water The advantages of a boat thus constructed are, that by having a false bottom made water-tight, as shown in the drawing, it will never sink, as long is this false bottom or working deck is secure, even should the boat be stove in The ballast should be fastened to the bottom of the boat, which will keep it always steady, and in one position in the water The boat so constructed may be worked by oars, but in a rough sea, the paddles would be far superior, the cranks may be worked by from eight to sixteen men at a time, and by having connecting rods, the cranks may be worked in the cabins. The false bottom may be continued from stem to stern, or terminate at the entrance of each cabin The boat may be made of timber, but sheet iron would be preferable

Having a boat of this kind at command in boisterous weather, mariners might steer clear of any rocks and shoals In going off to a vessel, the boat should keep to the leeward of it, and have a line in readiness, to make fast on with

A pulley block is afterwards fastened to the vessel, and a basket is drawn up and down the line that is made fast, by which the people are let down from the vessel, into the boat

SELF-ACTING FLOOD GATE OR CLOUGH.

Fig. 1.

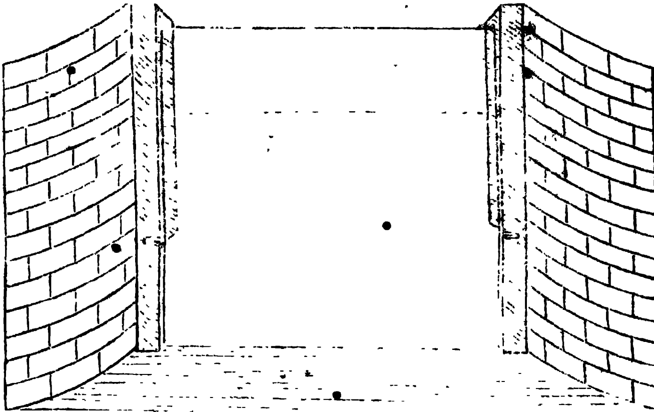
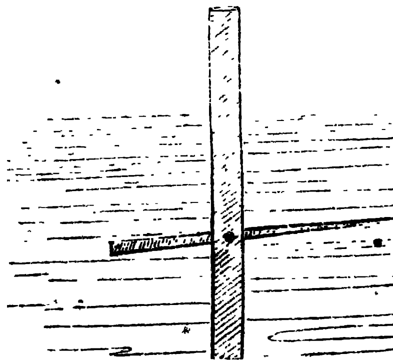


Fig. 2.

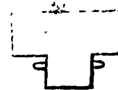


Sir,—If you think the above plan likely to prove serviceable, you are at liberty to insert it in your Magazine. The gate, or door, is of stout planks, thickest at the bottom below the centre, so as to make it much heavier than the top; by fixing the centres near the bottom, the water, after it has risen to the height of the dotted lines, so as to overcome the pressure of water below the centre, will cause the gate to open and continue so until the water lowers; when the pressure being heaviest at bottom will cause it to shut. By making the door in the form of a triangle, the centre can be fixed higher: or any form where the extra pressure of water at the bottom can be overcome by extra surface at the top, as in the following diagrams,

Fig. 3.



Fig. 4.



which would answer better than a square.

Yours, &c.

W. M.

March 15.

UNDULATORY MOTION OF LIGHT—MAGNITUDE OF ULTIMATE ATOMS, &c.

Sir,—Allow me to submit to the consideration of your intelligent readers the following question:—

Does not the passage of light through certain bodies, prove the correctness of the undulatory theory; and may it not be made available as a clue to a knowledge of the size of ultimate or primary atoms, by its transmission through a particular class of bodies, from the varied colour of transmitted light?

If finely attenuated gold be held between the eye and a strong light, it will be found to transmit only the *green* rays. Now, as light must make 47,460 undulations in an inch to assume a green colour, does it not leave strong ground for supposing that the primary atoms of gold are the $\frac{1}{47460}$ of an inch in diameter?

Your's respectfully,
WILLIAM JONES.

April, 1841.

ON PROPELLING VESSELS BY A JET OF WATER.

Sir,—Among the men who contribute to our improvements in arts and sciences, we must not undervalue the labours of inventors and projectors, who for want of fortune, or time, or activity, content themselves with suggestions, and never carry their contrivances into actual trial; by opening your pages to such men, you may, in my opinion, facilitate new discoveries.

Some years past, on observing the prodigious power of a fire-engine in ejecting water, it occurred to me, that if such a power was used by throwing the stream under water from the stern of a vessel, it might be made applicable in propelling her, and I recommended the trial by embarking a fire-engine in a large punt, and directing the stream of water produced by working it, through the end of the vessel below the surface of the stream; whether this was ever tried, I know not, but it occurred to me, that if it succeeded, we could easily procure a continued ejection of a column of water by means of an instrument of which I made a drawing, that I called a water bellows, and which was thus constructed:—

It consisted of two oblong boxes placed horizontally side by side, in a well resembling those in the fishermen's boats, placed towards the stern; they were each of them to have a square valve fastened to the foremost end of the box at bottom, by a waterproof hinge, and made to act on the sides and the other end of the box, which was a little curved, by a leather stuffing, the bottom of the box having a valve for the admission of water, whilst a tube connected with each box was united in one pipe without, so that by moving the large valves alternately, a constant stream might be kept up, fed by the water in the well of the vessel; and thus, when a sufficient force was applied to act on the great valves alternately, the vessel might be propelled by one forcible and continuous ejectment, against the passive element without.

At that time steam-engines were not much understood, and wanting such a power, I thought no more about my contrivance; but now that their use is so effectual, I should think on this principle something might be usefully done, and I lay it before your inventive correspondents with pleasure,

Being, Sir,
Yours, &c.
GEO. CUMBERLAND, SEN.

March 13th, 1841.

LAWS OF FALLING BODIES.

Sir,—As one who has found much pleasure in the perusal of your valuable miscellany, I have ventured to address a few lines for insertion (should you think them fit), showing that the phenomena of falling bodies, as exhibited by Newton's law, is not the same as actually exhibited by falling bodies at the earth's surface. The principle theorems for falling bodies, as given by writers on mechanics are, that the spaces are as the squares of the times, or of the velocity: the velocity acquired by a body falling from any height, must therefore be equal to twice the time occupied in falling from that height, and the time and velocity will be as the square root of the height fallen. From this it appears, that the greater the height descended, the greater will be the velocity acquired at the end of the fall. But it would appear, that as the force which causes the descent

varies inversely as the square of the height, the velocity at equal altitudes ought to be the same, without any regard to the height; but according to the Newtonian doctrine, there is in matter a principle of inertia, by which it retains all the force that is impressed upon it unless deprived of it by some other opposite force; and therefore the greater the height from which a body falls, the greater will be the velocity acquired at the end of that fall. This then appears to be a true explanation of the phenomena of falling bodies at the earth's surface; for we see that the greater the height from which a body falls, the greater is its velocity at the end of the fall.

But there appears to me to be a stumbling block in this explanation, for according to the foregoing theorems, the velocity generated in the same instant of time, is supposed to be the same, without any regard to the height, which is not the fact, and therefore these theorems dot not exhibit the phenomena of falling bodies as observed in nature. The distance of the moon from the earth's surface, is 1236734400 feet, then we have $\sqrt{\frac{1236734400}{16}} = 8794$ minutes, for the time of a body falling from the moon to the earth, and $8794 \times 2 \times 16 = 281408$ feet per minute for the final velocity. Now, suppose a body to fall from some point ten times higher than the moon, the velocity generated in the first minute will be ,16 of a foot, then we shall have $\sqrt{\frac{12367344000}{,16}} = 278003$ minutes for the time of the descent, and $278003 \times 2 \times ,16 = 88961$ feet per minute for the final velocity. Let us now compare the difference of the times of descent and the final velocity at the end of the descent, when we shall have $\sqrt{\frac{12367344000}{1236734400}} =$

$$3,16 \text{ and } \frac{281408}{88961} = 3,23, \text{ and}$$

$$\sqrt{\frac{12367344000^3}{1236734400^3}} = 31,6 \text{ and}$$

$\frac{279003,}{8794,} = 31,6$; and again, $\sqrt{\frac{278003}{8794}} = 3,16$ and $\frac{287408}{88961} = 3,23$. That is, first, the velocity is inversely as the square root of the height; second, the time of descent is directly as the square root of the cube of the height; and, third, the cube root of the time is as the velocity. Now, in this demonstration I have adhered strictly to the rule laid down by Newton, and the result shows that it does not agree with the theorems laid down by writers on mechanics for uniformly accelerated motion; nor does it agree with what we see around us. But I cannot suppose that Newton or his followers were, or are, ignorant of what is here stated, and I have no doubt but that they have some means of accounting for the seeming contradiction; but I never saw it accounted for in any works on the subject, nor can I find it out. I shall therefore be thankful if any of your readers, who are advocates for the Newtonian doctrine, will explain this seeming contradiction, or point out my error if I have committed one.

W. DAVISON.

Edgley, Stockport, March 10th, 1841.

THE NEW STEAM FRIGATES.

On Thursday, the 1st inst., a first trial was made on the Thames in the presence of the Lords of the Admiralty and other distinguished persons, of the steaming powers of the *Driver* and *Ardent*, two of the new class of steam frigates.

The *Driver* is of 1,100 tons burden, and 280 horses power; the *Ardent* of 800 tons, and 200 horses power. Both vessels have been built from the designs of Sir William Symonds, the Surveyor of the Navy, and have been fitted up with steam engines by Messrs. Seaward and Capel, on the plan of those commonly called the *Gorgon*, from their having been first applied by that eminent firm to the war steamer of that name.

The vessels started from Blackwall at 9 A.M., and the speed of both was found to average about 10½ knots an hour, notwithstanding each vessel had on board 160 tons of fuel, besides 50 tons of ballast. On the arrival of the vessels at the end of Long Reach they were put through various manœuvres, to try the efficiency of Mr. Samuel Seaward's new invention, for almost instantaneously disconnecting the paddle wheels of steamers from the engines, whenever it

is desired to suspend for a time the use of steam power, and of reconnecting them with the like celerity, when required to be brought again into action. Both operations were repeatedly performed within *two minutes* from the time of stopping the engines. Another interesting experiment was made to show the applicability of this connecting and disconnecting plan to the working of a vessel round on its centre. One wheel only was disconnected and held fast by a break, while the force of both engines was applied to the other wheel; this had the effect of turning the vessel completely round, the fixed wheel becoming the pivot upon which she turned. The opposite wheel was then disconnected, the loose one reconnected, and both engines set to work, when the ship turned round in the opposite direction.

The Earl of Minto, Sir William Parker, and the other Lords of the Admiralty present, expressed their unqualified approbation of the invention, and orders have, we understand, been given to have several other frigates fitted with it. The plan is as simple as it is efficacious, consisting merely of a moveable head upon the crank of the paddle shaft, by the turning of which one quarter of a circle either right or left, the wheel is held fast to the engine or entirely released. For a more detailed description the reader may consult our 894th No.

The *Driver* is immediately to proceed down the Channel to Pembroke, to tow round the *Geyser*, of 1,100 tons, already launched at that port. The *Ardent* will proceed to Chatham, there to be rigged and commissioned. The *Polyphemus*, of the same class and power as the *Ardent*, now at Chatham, has been ordered to proceed forthwith to the West Indies.

The *Driver* will stow in her engine-room, which is 52 feet long, 300 tons of fuel; this is equal to 16 days consumption, in which time she will steam 3,840 miles. The *Ardent* will stow 200 tons, being equal to 13 days consumption, in which time she will steam 2,800 miles.

The lines of these two vessels are remarkable for their symmetry and beauty, and do great credit to the taste and skill of Sir William Symonds. Taken altogether—whether we look to their steaming or sailing capabilities—to the ample stowage provided for fuel without entrenching on the room required for working the guns and the comfortable accommodation of the men—or to the very exact adaptation of the engine power to the size and weight of the vessels—they may be safely pronounced to be the very best of their class yet produced.

VELOCIPEDES.

SIR,—In the *Mechanics' Magazine* of April 3, I notice a letter on the construction of Velocipedes from an "*Amateur.*" As I have an idea of procuring a machine of the kind for my own use, I should feel greatly obliged to your correspondent, if he would permit me an interview any evening that he may have at liberty; or would favour me with a drawing of the machine, which he recommends, at the same time entering rather more minutely into the details.

Allow me to propose one question. In using this machine on a common road, and going down a steep hill, would the rider have sufficient control over it, to prevent its gaining a dangerous impetus?

I am Sir, your obedient servant,

GORDON LYNCH.

129, Fenchurch-street, April 5, 1841.

WARMING BUILDINGS BY HOT WATER.—REPORT TO THE MANCHESTER FIRE ASSURANCE COMPANY. BY MR. JOHN DAVIES, M. W. S., AND MR. G. V. RYDER.

(From the *Civil Engineer and Architect's Journal.*)

"Before we proceed to detail the experiments which we have made, we shall briefly describe the appearances observed, and the information obtained at a few of the principal places which have been visited. We shall then be enabled not only to confirm but to extend the statements in Mr. Ryder's first report.

It has been found, on inspection, that Birch Chapel has, at various times since the occurrence alluded to in the former report, sustained much damage. Wood, matting, and cushions have, in a variety of places contiguous to the hot water pipes, been charred to an alarming extent.

With respect to Mr. Barbour's warehouse, farther inquiry has fully corroborated the previous statements of its having been on fire, close to the pipes, at different times and in different places.

Of the Unitarian Chapel, in Strangeways, the directors are already in possession of information from both Mr. Ryder and Mr. Rawsthorne, and this information seems to leave no doubt as to the injury which has resulted from the use of Mr. Perkins' hot water apparatus.

The heat in the Natural History Museum having been repeatedly stated to vary in different parts of the pipes, and to become, in some cases, the greatest at places remote from the furnace, the fact has been confirmed by our own observations, and by our subsequent experiments. As this circumstance has excited much interest, and been generally questioned, we shall presently endeavour to assign the cause.

The apparatus, which it may be proper to notice in reference to its general form and construction, consists simply of a long, endless iron tube, carried, in different directions, from a furnace to which it returns, and in which about one-sixth of the whole length is inserted and formed into a coil, so as to be sufficiently exposed to the action of the fire. The tube is, at the commencement, filled, or nearly filled, with water, which, by the application of the heat, soon begins to circulate, and, in that way, to impart an increase of temperature to the apartments which it traverses. The dimensions of the pipes are such, that, on the average, eleven feet in length will contain one pint of water. Connected with the principal pipe are two others, which are opened by a screw, one to allow for the ultimate expansion, and both subservient to the introduction of water.

As far as lay in our power, we have made such experiments as occurred to us, repeatedly, and under every variety of circumstance.

Not having any instruments which would furnish speedy and adequate criteria for the determination of high temperatures, we have resorted to the inflammation of combustible bodies, and the fusion of others, depending on the recent and high authority of Professor Graham for the degrees which they indicated.

The ordinary method hitherto resorted to for ascertaining high temperatures in the pipes, is to file a small portion perfectly smooth, and observe the progressive changes of colour which occur. We did not neglect this expedient; and we witnessed, to great advantage, the successive and beautiful tints. As the temperature increased, we were presented first with a straw colour, then a deep bluish purple, and, finally, with a dark silvery hue. The first is said to indicate 450°, and the blue 600°.

In the Natural History Museum we applied our tests, but were enabled to do so only to a very limited and unsatisfactory extent. Mr. Walker, the proprietor of the patent right for Manchester and the neighbourhood, accompanied us to the establishment of Messrs. Vernon and Co., engravers, where we had the opportunity of trying the system rather better, but still imperfectly. Finally, Mr. Walker acceded to our request, to have put up on his own premises, a suitable apparatus, which was to be submitted entirely to our control. It consisted of an iron pipe upwards of 140 feet in length, 26 of which were coiled in the furnace; 20, at least, being freely exposed to the full action of the fire.

In addition to the apparatus, as at first fitted up, we had a branch pipe and a stop cock, which enabled us, by cutting off at pleasure a great portion of the circulation, to perform our experiments on a contracted scale, and under a variety of modifications.

Mr. Walker being from home at the time, placed his foreman entirely under our directions, so that we had the opportunity of pursuing the investigation to any extent which we might think proper. It is but justice to state, that this person rendered, very willingly and with much practical skill, all the assistance which was required.

The apparatus having, on Friday the 5th ult., been fitted up and found on trial, to be in proper condition, the experiments were commenced on the following morning at ten o'clock, when the apparatus had arrived at a suitable state.

I. *First Class of Experiments, viz. those made with the whole length.*

1. The pipe from the furnace became very soon sufficiently hot to singe and destroy small feathers resting upon it.

2. Speedily afterwards, the same pipe exploded gunpowder.

3. On the highest pipe, within a foot of the expansion pipe, bismuth was readily melted, denoting a temperature exceeding 470°. The pressure at this point must have exceeded 35 atmospheres, or above 525lb. on the square inch.

4. Feathers were singed instantly, and matches lighted, at the same place.

5. Gunpowder inflamed readily in various parts of the flow pipe, and on the expansion pipe.

6. Blocks of wood, of five different species, were charred; from the deal wood the turpentine issued profusely.

7. Other combustible materials were also severally much charred.

II. *Class of Experiments, with the shorter circulation. By this change a greater pressure was immediately observable, as the expansion pipe and several of the joints emitted steam, and admitted the escape of water.*

1. Cane shavings, on the pipe above the furnace, readily inflamed.

2. Lead melted at the same place; and the temperature must, therefore, have exceeded 612°. Making a rough calculation from the table of the French Academy, which does not extend beyond 50 atmospheres, I take 612° to represent 75 atmospheres, or about 1,125 lb. pressure on the square inch.

3. Different wood shavings inflamed on the upper pipe.

4. Cotton ignited freely at the same place.

5. Matting inflamed at the same place.

6. Cotton, hemp, and flocculent matter, collected from Mr. Schunck's fustian room, ignited on the returning vertical pipe.

7. The blocks of wood, tied to different parts of the tube, were much acted upon and charred in a very short time.

Observing the expansion pipe to be in a state of considerable agitation, and warned of an explosion, the temperature was reduced, and the experiments were, for a time, suspended.

The pipes having, before three o'clock, been refilled and screwed up, for the express purpose of an explosion, the following experiments were made in the progress of the preparation :—

1. Mungeet was readily ignited.

2. Different sorts of paper and pack thread were destroyed.

3. Bismuth fused instantly.

4. Cotton inflamed.

5. Sheep's wool became speedily charred, in 2″ or 3″ after the stop-cock closed.

6. At five o'clock the sheet lead, affixed to the upright pipe, freely melted; steam issued violently from the bend in one of the upper horizontal pipes, and, in three minutes afterwards, the explosion occurred in the furnace pipe, at the top of the seventh coil, which presented, on subsequent examination, a lateral aperture about two inches long and about one-sixteenth of an inch broad.

In the lapse of two or three minutes after the commencement of the explosion, the furnace was entirely emptied of its contents, which were propelled, in a diverging direction, like one mass of fire, so as almost to fill the apartment. The force with which the ignited embers rebounded from the opposite wall, and other obstructions, occasioned them to scatter in profusion like a shower of fire over every part of the place. The noise was so great as to bring to the spot a multitude of people from the adjoining streets. A number of articles in the shop—as, for example, packing cloth, paper, and hemp—were subsequently found to be on fire in different parts of the premises.

These appearances, and their immediate effects, seem to have been precisely similar to those which are said to have been witnessed at the explosion in the warehouse of Messrs. Crafts and Stell, and would evidently have been adequate, in the same situation, to produce all the consequences.

It may be here observed, that the experiments clearly prove, that the heat, in different parts of the pipe, is not uniform. Generally it is greatest at the highest elevation, where its superior temperature appears to be of the longest duration under ordinary incidental changes. At the commencement of the operation, however, and a short time after fresh fuel had been applied, the temperature was highest in the flow-pipe contiguous to the furnace. Another circumstance likely to produce an inequality of heat, may be adverted to : the tubes are far from being of uniform internal diameter; the consequence of which must be, that as the same quantity of water has to pass, in the same time, through every part of the apparatus, the liquid must move with greater velocity at one place than at another, and thus from obvious causes, develop a greater quantity of caloric. The difference is sometimes so great in the relative bores of the tubes employed, that in some which were examined, one tube had an internal diameter of 9-16ths, and another of ¾ths of an inch, that is to say, in the ratio of three to four ; or, taking the relative areas or sections of the tubes, which represent the relative quantities of fluid contained in a given length, in the proportion of nine to sixteen. Thus, taking the velocity reciprocally as the section of the pipe, the velocity of the water at one part of the apparatus being represented by sixteen feet, the velocity in another part would be nine, or the rapidity of the current would be at one place nearly double that which it was at another.

It is stated, in a work recommending the hot water system, that "the application of heat fills" the ascending or flow-pipe "with minute bubbles of steam which rise rapidly to the upper part of the tube, and become there condensed into water again :" now, as condensed steam, wherever it occurs, produces about seven times as much heat as the same quantity of water at the same temperature, we have at once, a reason for the heat of the pipe being generally greater at a distance from the furnace than contiguous to it. This apparent anomaly, which has been repeatedly observed and denied, admits, therefore, of an easy explanation.

The explosion may, under different circumstances, occur from various causes.

1. As water expands in bulk about five per cent. from 40°, its point of greatest density, to 212°, the boiling point, the expansion must be very considerably more when raised to high temperatures. If, therefore, the pipes be nearly filled with water, and the expansion pipe not adequate or in proper condition, an explosion must be inevitable. Dr. Graham states, that, from freezing to boiling water, the expansion is from 22.76 to 23.76 = 100 to 104.4 nearly.

2. The conversion of the water into vapour, producing an expansion which is in the proportion of a pint of water changed into 216

gallons of steam, "with a mechanical force sufficient to raise a weight of 37 tons a foot high," must present a pressure upon the tubes sufficient to ensure their destruction. Dr. Graham makes a cubic inch of water to expand into 1,694 cubic inches of steam, or one pint of water to become nearly 212 gallons.

3. It has been observed, as an ordinary occurrence, by those much accustomed to the apparatus, that, in some cases, a quantity of gas is generated, and has been found to escape in considerable quantity, when an aperture is made in the upper part of the pipes. The only gases which could be thus obtained are the elements of the water, oxygen and hydrogen. The former would probably be taken up in the oxydation of the metal. Now the hydrogen gas, which would remain, has never been deprived of its elasticity, and never made to change its state, by any compressing force hitherto applied. It is obvious, therefore, that inevitable danger must arise from its production. It may be worth while to remark, that air, steam, and hydrogen gas expand in the same proportion by augmentations of temperature. The law discovered at the same time, and by independent methods of experiment, arose out of the researches of Dr. Dalton and M. Gay Lussac. It may be thus expressed: Aëriform bodies expand the 1-480th part of their bulk on the addition of each degree of temperature. Thus, taking 480 cubic inches of steam or hydrogen gas at 32°, the mass becomes, at 33°, 481 cubic inches; at 34°, 482 cubic inches; and so on: or, in a general form, a bulk a raised $d°$ of temperature becomes $a + \frac{d}{480}$

4. The last source of explosion to which it is necessary to refer, arises from any casual impediment in the pipes; and it freely admitted, that in frosty weather such an impediment is likely to occur; it has been found to result from other causes, as in the case of extraneous matter accidentally getting into the pipes, an example of which was recently presented in the establishment of Messrs. Wood and Westheads.

In a very obliging letter received, in the course of the investigation, from Sir Robert Smirke, it is stated, that, though he has "never seen the pipes heated sufficiently to ignite wood, except on one occasion," yet, "if a fire is incautiously made when there is a stoppage in the pipes from frost or other accidental cause, the pipe within the furnace, may be burst or made red hot near the furnace. I have known the pipe," he adds, "so heated only in one instance, when the red heat extended to a distance of upwards of 12 feet from the furnace."

Sir Robert concludes his letter by suggesting a protective modification of the apparatus. "Therefore," he observes, "to prevent the risk of fire to a building, I would never place the furnace in a room or cellar that is not fire-proof, nor would I have the pipes in any part of their circuit in *actual contact* with wood or other combustible material. Security," he continues, "is still more effectually attained by having a safety valve upon the pipe near the furnace, by which explosion or excess of heat would be prevented."

That which has happened once, may, under the same circumstances, happen again. The exclusion from *actual contact* with combustible materials, could it be permanently ensured, would, when the red heat extended along the pipe upwards of 12 feet, afford, at least, very reasonable grounds for apprehension.

On this system of warming buildings, therefore, danger must be produced from either negligence in the feeding of the furnace, or any stoppage in the pipes: the former evil may be obviated by proper precautions; but the latter, occurring unexpectedly, exists unobserved, and precaution and care must be equally unavailing."

Signed. JOHN DAVIES,
GEORGE VARDON RYDER.

March 10, 1841.

NECESSITY FOR A FIRE POLICE IN DUBLIN.

(From the *Citizen*, a Dublin Monthly Journal.)

There is no subject in which all classes of our readers are more directly and permanently interested, than that to which the title of the present article refers. We have hailed with much satisfaction, the adoption of popular representation in the management of our municipal affairs; and although we are not entirely satisfied with the details of the measure just passed, for the regulation of Corporations in Ireland, we look to time and experience for amendment, in those points to which we see reason to object. Meanwhile, we hope that every effort will be made by the newly constituted bodies, to promote the greatest degree of practical improvement in their government; and amongst the objects deserving and requiring public attention, there cannot well be one of more interest to the community, than the best means of affording the greatest possible degree of security to the inhabitants of a city, against all the horrors of conflagration. It is one, however, that has never been well understood in Dublin; or if understood, the best measures have not been acted upon here, nor indeed, except partially, and of late years, in many other cities.

The system of insurance against ruinous

pecuniary losses that might otherwise be the consequence of fires, is excellent; and the abundance of competition ensures that partial alleviation being obtained on reasonable terms; but the provisions for the diminution of the actual evil, and for the general safety of life and property, are very faulty. The insurance companies being deeply interested in the prevention of any great extent of destruction of property at one period, induced them to set up, for their own security, establishments of fire engines, ready to turn out at every alarm; and the consequence has been that the complete business of extinguishing fires has been thrown into their hands.

This is highly objectionable on many accounts.

First—The unfairness of laying the entire charge of this peculiarly necessary establishment and business upon insurers, that is upon the prudent, for the protection of the whole population.

There cannot be a doubt of the justice of taxing the whole community in proportion to their property, for precautions that are absolutely necessary for the safety of all.

Secondly—This business is not in accordance with the habitual avocations of the persons composing these companies, who must usually consist of capitalists and office men, and whereas this particular branch bears but a very small proportion in their general business as insurers, it is quite a chance if any of them individually should possess acquirements that would assist them in regulating or controuling it with any effect.

Thirdly—These companies in this very important undertaking are entirely irresponsible to the public for their proceedings: what they do is purely for their own advantage, they may increase or they may reduce their means or their exertions, at their own pleasure. Should people be remiss in insuring, the companies might think it prudent to diminish their establishments of engines, or to abandon them altogether, and certainly nobody would have any right to complain.

It may be said this is not likely to happen; but it is sufficient to show, that there is no obligation on their part, and that it is quite possible that their interest may not be to make any great provision or exertions, in order to prove the system to be bad.

Fourthly—These parties are not only independent of the public in their arrangements, but they are also independant of one another, consequently there is no combination or union among them, or in their proceedings; each has its own distinct establishment, which it retains and uses without reference to the others—hence must arise on some occasions a deficiency and on others a superabundance of some particular means, and a want of the general arrangement that should enable the efforts of the whole to be directed in the most regular and efficient manner for attaining the object in view.

In London, Liverpool, and some other cities, a great improvement has been made of late years in this respect. In London the insurance companies have organized an united establishment under one competent superintendent, which enables the whole force to be applied in a far more economical, judicious, rapid, and energetic manner than previously. In Liverpool they have still further improved by not only forming one single establishment, but making it a part of the police force; still, however, even there the insurance companies contribute a large sum towards it; for which there is no reason.

It may be conceived that these companies have a peculiar interest in the matter, but in fact any expenses so incurred are defrayed by the insurers, and not taken from the profits of the company.

Fifthly—Another objection to this system is the want of connection, and consequently of the most perfect mode of co-operating with other bodies and establishments whose agency is absolutely necessary at every fire, such as the companies or departments which manage the provision of water, the police, &c. Also the want of some necessary legal powers, that for the general benefit, are usually conconceded to duly authorized bodies, subject to proper control and responsibility against their abuse.

While this system is in Dublin necessarily liable to many of the above inconveniencies, there are others which most materially impede the great end in view.

The action of the insurance companies in this undertaking, only extends to the providing of fire engines; and it must be allowed that they are not only abundant and of good quality, but that arrangements have been made for their being brought out in sufficient numbers and in ample time for any useful service, that under present arrangements, they could render.

The greatest defect is in the want of means for obtaining a ready supply of water; this in all places is the principal want, and one that in all, there has been least pains taken to remedy, by a proper obligation on those who would best provide those means, by a well regulated mode of action, and by a suitable provision of funds to defray the expense.

In Dublin the inattention to this point is peculiarly great, and the evil is peculiarly to be deplored; since there are few cities so favourably circumstanced for a ready supply.

Besides the river, which traverses and

divides the city into two equal parts, there is a canal on each side, surrounding it quite close, affording abundance of water, and at very high levels; the great basin at Portobello, on the south side, connected with the Grand Canal, capable of containing 1,000,000 cubic feet of water, is 50 feet above the high water level of the river, with two smaller cisterns still higher; and another on the north side connected with the Royal Canal, which will hold near 500,000 cubic feet, is 60 feet above the same level.

From these reservoirs, pipes have been laid throughout the town, but with so few cocks for obtaining the water on occasions of fire, as to be scarcely worth mentioning; nor indeed are many of the pipes themselves capable of affording the necessary supply until after a considerable interval; thus it is seldom till an hour after the first alarm is given, that the engines can be worked effectually, during which period a fire gets very great head; whereas, a moderate supply of water, and moderate means applied during the first half hour, would probably extinguish it, save a vast amount of valuable property, and prevent much distress—at least such is almost universally the remark of persons who have witnessed these occurrences from the beginning.

Besides this advantage with respect to sources of water, Dublin possesses some others of much importance, if they were turned to proper account.

It is very compact, every part of its outskirts being nearly at equal distances from the centre; it may be called level generally speaking, and is intersected in almost every direction by broad streets with good carriage ways.

Besides its large population, which, as in other towns it may be difficult to regulate for efficient service in a hurry, and more particularly by night, it contains a considerable police and a large garrison of troops. Another establishment affords much assistance, and by improved arrangements with a good fire police, is capable of rendering still more, namely, the Paving Board. At its station in Mary-street, a central position, are kept thirty large watering carts for watering the streets, and thirty horses, each cart capable of containing 200 gallons of water; a few of the drivers live on the spot, and others in the neighbourhood; six of these carts are kept full all night, and turn out at any alarm of fire as speedily as possible, the remainder (which are empty) follow and get supplied, with water at the nearest watering station to the fire.

The progress of circumstances as they take place on the occurrence of a fire in Dublin when it breaks out in the night, is usually in the following manner:—

The police patrol will probably be the first active person who has notice of the accident. Having alarmed the inmates of the house and taken any immediate measures for assisting in their personal safety, it is his business to give information to the Divisional Station; and about twenty police men, whose duty it is to be prepared to turn out at the shortest notice, are collected at the spot in from 10 to 20 minutes, and render every assistance in their power.

(To be concluded in our next.)

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

HENRY PINKUS, LATE OF PANTON-SQUARE, COVENTRY-STREET, BUT NOW OF MADDOX-STREET, REGENT-STREET, ESQ., *for improvements in the methods of applying motive power to impelling machinery, applicable, amongst other things, to impelling carriages and vessels, and in the methods of constructing the roads on which carriages may be impelled.* Roll's Chapel Office, March 24, 1841.

The lucubrations of this inveterate *schemer*, are in this case set forth in a rambling manner, and occupy fifteen skins of parchment, with a proportionate quantum of drawings. Our prescribed limits forbid our going into details; we shall, therefore, briefly notice these "*improvements*" under their respective heads.

Firstly, the patentee claims the invention of a "differential railway," consisting of a double line of railway, on which, at suitable distances apart, are fixed a series of gas-exploders (included and described in one of his former patents,) furnished with two large horizontal wheels, placed one above the other, round each of which an endless metal band passes. Between each pair of these gas exploders, there is an intermediate pair of wheels; an endless band from one of the horizontal wheels passes round one of the intermediate wheels in one direction, whilst a similar band from the other wheel passes round the second intermediate wheel in an opposite direction. Motion being communicated from any convenient prime mover, the bands run upon wheels placed in the centre of each line of rails, and put them in motion, which motion is communicated to the train of carriages by means of bars extending from the bottom of the same, and which are kept in contact with the wheels.

A second improvement consists in a mode of propelling boats on canals by the "gaso-pneumatic" power. Throughout the whole length of a canal, on one or both banks, a suspension rail is constructed; and along the canal, in a line with this rail, a gas main is laid down. Upon the rail is suspended an impelling machine, consisting of a frame on

wheels, furnished with two horizontal pulleys, round one of which an endless band passes from a pulley in the boat to be impelled, in which is placed the gaso-pneumatic engine. This engine actuates the pulley in the boat, which, by means of the endless band, communicates its motion to the horizontal pulleys, which in turn give motion to the running wheels, and cause the impelling machine to move forward and draw the vessel.

In another arrangement, a steam engine is used instead of the gaso-pneumatic engine to work the impelling machine; and in order that vessels may travel in opposite directions with only one line of rails, the impelling machines are taught "leap frog," *i. e.*, they are made to move over one another, and so proceed on their respective journeys!

The patentee next proceeds to dabble in electro-magnetism, and sets forth the following novel and wonder-working arrangements. In any given spot of land a central station is to be erected, in which is to be placed an electric battery—or tanks, similarly provided are constructed. From this central station, or from these tanks, a system of pipes or mains are laid down, along which, at intervals of from one to two hundred yards, are erected short vertical branches, terminating in a box with a moveable lid. In the mains are laid continuous metallic wires, so arranged, that when their ends at the station, or tanks, are brought in contact with the two poles of a battery, they constitute metallic circuits. In order to make this arrangement available, the patentee employs a locomotive engine, as described in his former specification, except that the cylinders, piston-rods and their appurtenances are dispensed with, and the drum is of smaller dimensions. Round this drum is coiled a pair of wires, and these are attached to a similar pair in one of the boxes before mentioned. To the locomotive an electro-magnetic engine is applied, and, in order to set it in motion, electrical action is induced, in the batteries at the station or tanks, which influence acting through the metallic circuit communicates the required motion to the impelling engine. The electric power is also employed to prevent collisions on railways, by putting the breaks in action, which our readers will perhaps remember, formed the subject of a patent granted to Mr. H. M. Grover, an extract from whose specification appeared at page 479 of our last volume.

The electric power is also applied to the lighting of railways, tunnels, roads, &c. A "glow," or "brush," is effected at the required point, from whence the light is diffused to other parts by means of suitable stationary or revolving reflectors.

Finally, a plan is propounded for working fire-engines by the "gaso-pneumatic power." In this case, on the engine reaching the fire, the gas and water pipes are to be both opened; the former to supply the power, by which the latter is to be projected on the flames!

If any of our readers are sceptical on the matters herein contained, we beg to refer them to the Chapel, where, for "the small charge of a shilling," (less than a halfpenny a sheet) they may see the original specification, and form their own opinions of its merits.

William Horsfall, of Manchester, Card-maker, *for an improvement or improvements in cards, for carding cotton, wool, silk, flax, and other fibrous substances.* Enrolment Office, April 1, 1841.

The patentee commences by observing, that the cards for the above purposes have been heretofore, for the most part, made of leather; which material is objectionable from its want of uniformity. To obviate this disadvantage, backs made of sheet caoutchouc have been substituted for the leather, as also linen or cotton cloth cemented together, and woollen cloth saturated with a solution of india-rubber; but these are also said to be objectionable, as being injuriously affected by changes of temperature, and also to be damaged by drops of oil falling upon them.

To provide a remedy for all these defects, the present patentee makes the backs, or foundations of cards for carding cotton, wool, silk, flax and other fibrous substances, in the following manner:—

Firstly, by using thick woven cloth, made of fine sheep's wool shot upon a warp of flax, hemp or cotton thread, coated with certain compositions by which the flexibility of the cloth is little, if at all, impaired. Or, Secondly, a thick woollen cloth with a web of thin smooth cotton or other suitable fabric connected to it on one or both sides.

To give the first of these cloths the requisite coating, the patentee takes the composition which painters call distemper, made of weak size mixed with ochre; when this priming is dry, it is pumiced to remove any inequalities. A coat of boiled linseed oil is then laid on and set to dry. A good coating for the coarser sort of cards may be made of any oil paint mixed with a solution of soap, or of glue and treacle, with the addition of linseed oil; and in employing either of the two last compositions, one coating only will be required. But whatever may be the materials employed, this general rule is to be observed; viz.—that where oils, &c. are used, they must either be mixed up with other substances to prevent their running into the cloth, or have a layer of priming composition interposed between them and the cloth previous to their being applied.

For making the second sort of card backs, a thick woollen cloth, has a web of thin smooth cotton or other cloth cemented to one or both of its sides by glue and treacle, or other suitable cement of sufficient adhesiveness, and not acted upon by oils. In all cases the wires are inserted and secured into the backs, thus prepared by the usual card-making machinery, and in the ordinary way.

THOMAS JOYCE, OF MANCHESTER, IRONMONGER, *for a certain article which forms, or may be used as a handsome nob for parlour and other doors, bell-pulls, and curtain pins; and is also capable of being used for a variety of useful and ornamental purposes in the interior of dwelling-houses and other places.* Enrolment Office, March 30, 1841.

The article thus ostentatiously announced in the title of the patent consists of—bits of looking glass stuck into the articles thus fully enumerated! Or as the patentee more tastefully describes it—of a certain article formed by the application of a mirror having a brilliant surface adapted to reflect light, and to give a handsome ornamental appearance to the substance to which it is applied, which substance may be wood, bone, ivory, horn, papier machée, metal, or—any thing else, that is adapted for the several purposes enumerated.

The mirror may be of glass silvered, or of polished steel (and why not speculum metal?) of a form and size suited to the purpose to which it is applied; it is to be sunk into the front surface of the article, and held there by a rim or border.

The peculiar method of applying these mirrors to various articles is set forth in detail. The claim is to the article herein before described, which is formed by the application of a mirror in any of the ways shown and described, to the ordinary substances whereof like articles have heretofore been, or may be made.

FREDERICK PAYNE MACKELCAN, OF BIRMINGHAM, *for certain improved thrashing machinery, a portion of which may be used as a means of transmitting power to other machinery.* Erolment Office, March 31, 1841.

The improvements comprehended under the patent consist:

1. In certain improved combinations of machinery for communicating the force of the prime mover, particularly that of horses, to the drum of a thrashing machine, or to any other machinery of suitable construction.

2. In a peculiar mode of combining the concave surface denominated the "bed," to the framing of the thrashing machine.

3. In the application of a broad endless band, as a substitute for the ordinary "feeding table."

In carrying out the first improvement, a vertical axis is fitted with a cross head at top, with a pole for the horses to draw by: this pole has a counterpoise weight to keep it in equilibrium on each side the axis. The axis carries a spur wheel, which drives a pinion on a separate axis, having at its lower end a large pulley or drum. This pulley (which from its weight acts as a fly wheel) carries an endless band which drives the thrashing mill or other apparatus that has a pulley to receive it. The large pulley is not keyed upon the axis, but is carried forward by a ratchet wheel and pall immediately above it. This allows the horse to stop or go backwards without injury to the machinery. The power is communicated by the endless band, which passes through wooden troughs horizontally.

The thrashing machine consists of a framing of wood, having an axis revolving horizontally in plummer blocks fixed on each side of the machine. On this axis an hexagonal drum is mounted, having two sets of six wooden arms connected by iron bars to which the beaters are bolted; the ends and sides of the drum are close boarded, and some small holes bored through to let out the air when expanded by the centrifugal force.

The "bed" consists of a square frame with two diagonal braces, and made concave on the under side; this frame is close boarded on both sides, and fluted plates of iron are screwed up to the under side. The bed is hinged to the back posts of the framing, so, that a line drawn from the hinge should be a tangent to the centre part of the arch formed by the concave fluted surface. The distance of the fluted plates from the drum is regulated by two screws resting on the feeding table. In the operation of thrashing, the corn is pushed into the mouth, and is immediately struck upwards and carried by the beaters along the surface of the concave, after which it is thrown out upon the floor. In case of too large a mass of straw being introduced, or any improper substance that could not pass in the space allowed between the drum and the concave, the bed which is kept down by its own weight only, rises bodily by turning on its hinges. In thrashing barley and other unbound grain, the patentee prefers a cylinder and concave studded with large headed nails.

The improved substitute for the ordinary feeding table, consists of a pair of rollers close to the mouth of the machine, moving together by two pinions at their extremities; at the farthest end of the feeding table there is a single roller turning freely in its bearings. The lowest of the pair of rollers is driven by a band from the drum spindle. An endless band, the width of the feeding table passes round the lower roller at the mouth, and the single roller at the other end;

this band, when in motion, carries the corn into the mouth of the machine. The claim is; 1. To the horse engine. 2. To hinging the bed of the thrashing machine in the line of the tangent to the centre part of the concave. 3. To the endless band as a moving feeding table. 4. To the drum and concave surface.

George Ritchie and Edward Bowra, Gracechurch-street, Manufacturers, *for improvements in the manufacture of boas, muffs, cuffs, flounces, and tippets.* Enrolment Office, April 1, 1841.

The first, is a mode of manufacturing boas, muffs, cuffs, &c., by (in place of ordinary padding) filling them with air which may be contained in bags or other suitable recipients, whereby a greater degree of elasticity is said to be obtained, as well as a degree of buoyancy, which, in the event of an accident happening to the wearer by falling into the water, would be the means of supporting them.

The second, is a mode of manufacturing that description of cuffs which are attached to the bands of the sleeves of gentlemen's shirts, and ladies' habit shirts (?), which are also called wristbands.

The mode of manufacturing boas, is as follows:—the skin, or outer fabric of which the article is to be made, being properly prepared, small bags about four inches long by two inches in diameter, or according to the size of the boa required, are filled with air and placed within the external covering which is closed over in the ordinary way. The patentees do not, however, confine themselves to this precise mode, as the whole interior of the boa may be made air-tight and filled with air, or inflated balls of india-rubber may be used. So far well, but we blush for what follows. Cuffs, which according to the good old plan, are joined to the ends of the sleeves of shirts, as is well known, are to be superseded by the following improvement—which consist in making what the patentees call a "double cuff;" *i. e.* two cuffs, one of which is made to turn under during the time the other is being worn. The advantage of this is, that should the shirt cuffs become dirty without the wearer having the convenience of changing the shirt, he can at least change the cuffs, the dirty one being turned up, and the clean one brought down.

The claim is; 1. To the mode of packing or filling boas, muffs, tippets, and flounces with air. 2. To the mode of applying double cuffs to the wristbands of shirts.

Thomas Wood, the Younger, of Wandsworth-road, Clapham, Gentleman, *for improvements in paving streets, roads, bridges, squares, paths, and such like ways.* Enrolment Office, April 2, 1841.

The blocks used by this patentee for the purposes of paving, are of two forms, viz., the section of the pyramid, having either a square or elongated (quadrangular) base, and the double wedge cut from either, having a square base or a similar elongated base. The patentee does not confine himself to any particular materials for his paving, which may be wood, stone, &c.; neither does he confine himself to any particular form for the blocks, nor to any particular angle; only the section of the pyramid and the double wedges must all be cut at the same angle. The most advantageous angle at which to cut or mould the blocks, range from 70 to 88½ degrees.

In paving, the blocks are so disposed that every other block in one series of blocks is the site of the pyramid standing on its smaller end; and every other block in another series of blocks is the site of the pyramid standing on its base. The intermediate blocks of both series are the double wedges which from their peculiar form combine equally well with the section of pyramids, whether the latter be placed on their smaller end, or their base, and a number of such alternate series of blocks being placed across a road, all the blocks are made to lean and press on each other on all sides in mutual support. Half blocks are used at the alternate side to break joint.

A number of these blocks are laid across a road between the two points of abutment, those blocks having the largest base of the pyramid upwards, being left standing, half an inch or more above the others; these blocks are then driven down, with wedges and consolidates the mass. Or in order to give good abutment for the feet of horses, each alternate block placed with the base of the pyramid upwards is half an inch higher than the adjacent ones. Another plan, is to make them from one to three inches higher than the others, and to fill in the space with concrete, coal-tar, asphalte, &c., heated and mixed with gravel, sand, &c.

The claim is, to the peculiar combination, construction, or arrangement of blocks of the forms specified and described, and the modifications of that peculiar combination, construction, and arrangement.

John Wordsworth Robson, of Well-close-square, Artist, *for certain improvement in water closets.* Rolls' Chapel Office, April 3, 1841.

These improvements refer severally to ship, portable, and house water-closets.

The water-closet for ships, consists of a bed-plate of cast-iron, having two sunk passages, each having two openings through the bed-plate. An ordinary basin or hopper is placed over one of these openings, and a short cylinder encloses the other corresponding opening, as also one of the openings to the other passage. This cylinder

may be 3¼ inches in height and about 6¼ inches in diameter, and is secured to the bed-plate by screws passing through its lower flange. To the upper flange of this cylinder, a conical blocked leather diaphragm or piston is secured by a metal ring and screws; to the middle of the diaphragm a piston rod is attached by metal plates. This conical-shaped leather top is 6¼ inches diameter at the top, 4 inches diameter at the bottom, and 2½ inches deep. The aperture in the bed-plate, opening into the cylinder, is closed by a loaded leather valve; from the cylinder there is a communication through the second passage to the soil-pipe head, also closed by a loaded valve. When the closet is placed below the water line of a ship, a hanging valve may also be placed at the extremity of the soil-pipe, so as effectually to prevent the ingress of water, if thought advisable, but is by no means essential to the safe and efficient working of the valve. A strong triangular-shaped metal upright stands upon the top of the cylinder, to the elbow or outer part of this upright, is attached one end of a lever, by which all the machinery is worked. A valve-tap stands upon the top of, and is firmly bolted to the upright, and is the medium through which the water passes from the cistern or reservoir, &c., to the basin. Through a stuffing-box in the centre of the lower plate of this valve, there descends a tap-rod, and above the stuffing-box is a small chamber covered with a strong leather valve, which is lifted by an upward movement of the tap-rod, thereby admitting water into the basin. An ordinary lifting piece rises through the seat, which being raised, lifts the piston rod and leather diaphragm of the cylinder, creating a vacuum therein, which causes the contents of the basin to rush into the cylinder, at the same time the tap-rod being also raised allows the water to enter the basin.

On again depressing the handle, the flexible piston ejects the water and the soil from the cylinder through the soil pipe.

The portable water-closet consists simply of a small cistern of water placed above the level of the seat, and furnished with a valve tap as before described; the basin is placed within a suitable vessel or receiver, its lower orifice being closed by a leather valve trap. The apparatus is worked by a lifting lever, which opens the valve and discharges the contents of the basin, at the same time, by acting on the valve tap, a supply of water enters and rinses the basin. On depressing the handle, a counterpoise weight effects the closing of the basin valve.

The house closet does not greatly differ from those in ordinary use, except that the cylinder and flexible piston (Martin's pump of 1766) is used to inject water into the basin.

The patentee claims—1. In the ship water-closet, the bed plate and tubes attached thereto, through which the soil and water pass from the basin into the cylinder, and from the cylinder into the soil pipe.

2. The leather valves by which the vacuum is produced within the cylinder, and in the valve box or soil pipe head; and the valve box in which the valve is contained.

3. The inverted conical-shaped leather cylinder top, with the metal plates upon the top and bottom thereof, and the method of working the same (so as to obviate the necessity of a solid piston, cylinder top, and stuffing box), by creating vacuum in the cylinder without friction—and by the application of less power than has ever before been used.

4. The valve tap in all its parts, by which water is admitted into the basin, with the tap rod and the method in which the same are worked.

5. In the portable closet, the valve tap, by which water is admitted into the basin; the leather valve at the bottom of the basin, and the method of working the said valve by a detached counterbalance weight, attached to the bottom of the lift piece.

6. In the house closet, the bed plate and tubes attached thereto, through which the water passes from the cistern or reservoir into the basin; and the leather valves within the cylinder and valve box, and the leather valve at the bottom of the valve plate, which works within the soil box; also the inverted conical-shaped leather cylinder top and metallic plates attached to the bottom thereof, and the method of working the same, as herein above fully described.

This specification is most miserably drawn, and seems to be of "home manufacture;" its composition displays a singular contempt of all the ordinary rules of orthography and syntax. The drawings, also, seem to scorn the trammels imposed on enterprising genius by the laws of perspective; in fact, any thing more *unartistical* can hardly be conceived. The laws of nature have been regarded full as little as the foregoing. Who ever heard of leather valves producing a vacuum?—(vide claim 2)—or how is it possible that a vacuum should be produced in places (the valve box and soil pipe head) where the only action is that of pressure? The patentee in this case might have consulted some *competent adviser* on these points with infinite advantage.

NOTES AND NOTICES.

Life Boats.—"*An old subscriber*" begs to ask—What is Dimsdale's life boat for steam vessels? Is it different from Captain Smith's, described in No. 843, October 5, 1839? What is Francis's American life boat? Which is the best and cheapest mode

of forming the air-tight boxes, of what materials, and how best secured?—*Dublin*, Feb. 11, 1841.

Limit to Mining Operations.—At the recent meeting of the Manchester Geological Society, Mr. Eaton Hodgkinson made some remarks on experiments conducted in several coal-pits in the neighbourhood of Manchester, and the salt mines near Northwich, in Cheshire, with a view to ascertain the change of temperature at certain depths. The only conclusion he had been able to come to on this subject was, that the temperature increased with the increase of depth. He had made no allowance for the difference of depth in reference to the level of the sea. Mr. H. added that one thing was very certain, viz., that from the increase of temperature downwards, a limit would be fixed to all our mining speculations at a depth of two miles.—*Mining Journal.*

Novel Application of Steam Power.—Numerous as are the ends to which steam has been applied, and its use extended in the present century, we question if its application, as a motive power, can, since the days of Hiero of Alexandria, be characteristic in any single instance of more inventive genius than in the one we have recently become acquainted with—one indeed strikingly exemplifying the triumph of genius in a department of mechanics the most unlikely to be brought under the operation of, or affected by, the steam-engine. We mean the formation of ordinary cart or coach wheels. It is some years since Messrs. R. and W. Russell, mill-wrights, at Loanhead, near Denny, were convinced of the practicability of performing, by means of a machine, certain descriptions of work hitherto confined in its execution to manual labour. We are scarcely qualified to give a technical description of the working of Messrs. R.'s invention, but from what we have seen, we may mention that it is moved by a steam-engine of six horse power—that the naves, the spokes, and felloes of wheels, are not only turned and perfectly formed out of rough wood in an incredibly short space, but each part is, at the same time, so ingeniously fitted for being joined to the other parts as to form a whole; each part being perfectly fitted and finished for that purpose. The naves are neatly perforated and mortised to the requite size, and fine openings formed for "bushing," and for the spokes which are "tenoned" on both the nave and felloe ends, and at once made exactly to fill the mortisings, while the felloes in their formation have the "dool" or rather dule holes, and the mortising for the "tenoned" or upper end of the spokes perfectly finished, all by the machine; so that manual labour is superseded, except for the mere purpose of cleaning and putting the parts together, which have thus been fitted so for each other as to form a perfect whole—a compact well-finished article, whether in the "joinings" or the general "make and finish" of the work, and hence in durability far superior to that produced by manual labour. We have seen the machine in operation and the work produced, and therefore speak with confidence when we affirm that, in durability and excellence of workmanship, (*machineship!*) Messrs. Russell's wheels have an undoubted superiority over those formerly in use; and we are happy to add, for the information of our agricultural friends, the cost will be less—sufficiently low indeed as to be bar to exportation; so that all the ends for which change is desirable are here effected.—*Stirling Journal.*

New Printing Process.—The *Orphine Process* is the name given by Mr. Morison to a peculiar method of printing, by means of cylinders, of which that gentleman is the inventor and patentee. The principle which forms the basis of the process is that, if two cylinders be made to communicate motion one to the other, by means independent of the contact of their surfaces, they will give off on each other, or on any intervening surface, exactly the same quantity of ink as may have been received, by one or more of them, from another cylinder moved by the same influence as the first. By the application of this principle, Mr. Morison is enabled to supply a surface of types with a constant and equal coating of ink; and whether the types, or other surface to be printed from, be placed on a cylinder and moved circularly, or a vibratory movement, backwards and forwards, be imparted to a plane surface, as the supply of ink keeps pace with the movement of the surface, impressions may be taken as rapidly as two men can supply and take out paper. The inventor has further applied this principle to cylinder printing in colours, which is effected by fixing round a drum a number of cylinders, each supplied with colouring matter from a separate inking apparatus, and so arranged that their several impressions upon the paper supplied by the drum combine and form an entire figure. The motion of the whole apparatus proceeds from that of the drum, from which all the cylinders receive their movement by means of cogs. A little literary production, called the *Page of Knowledge*, ornamented with coloured designs, has been produced by Mr. Morison, from a rough working model, and consequently under great disadvantages; notwithstanding which, and the badness of the designs, evidently the work of an unpractised hand and indifferent tools, it is evident that the principle is true, and that all the defects are owing to departures from it, which the restricted means of Mr. Morison were unable to avoid. One of the most valuable results of the process thus briefly described is, that, as the degree of pressure exercised by the rollers, one on the other, is completely under command, it becomes possible to take impressions from the slightest conceivable elevations, or from the most flexible substances, without wearing or depressing them. The designs in the above-mentioned pamphlet are printed partly from cork, partly from leather and soft wood, and others from relief drawings, executed by scratching on the reverse side of a thin plate of metal—a method which admits of producing designs with the greatest rapidity.

Immense Artesian Well.—At the sitting of the Academie des Sciences on Monday, M. Arago made a report on the Artesian well at Grenelle, which showed the great difficulties attending the undertaking. The first time the borer fell into the cavity was when the perforation had been made to the depth of 115 metres—377 feet. This was soon after the commencement of the operation, was soon recovered, and was in fact as nothing to what occurred in 1837. Then the length of the bars united together measured 384 metres—1,260 feet. Not only these broke, but the enormous metal spoon used to bring the materials to the surface, also fell to the bottom of the cavity, from a height of 80 metres—262 feet, and it required extraordinary exertions to recover it and draw it out again. The operation, which could only be worked by means of a windlass with horse-power working on the surface, occupied the whole time from May, 1837, to August 1838. The immensity of this labour for 15 successive months may be well conceived, when it is reflected that it had to act to a depth of 400 meters—upwards of 2,000 feet. This difficulty being overcome, the works were continued without any fresh misfortune until the 8th of April, 1840, when the *alesoir*, another part of the borer, fell from a considerable height with such force that it penetrated the chalk below to the depth of 26 metres—85 feet. This created great delay. In fine, a fourth accident occurred shortly before the successful termination, when the metal spoon again fell to the bottom of the bore, having nearly attained its extreme depth. This time M. Mulot thought it better not to attempt to draw it out, but to put it on one side by forcing it horizontally into the earth.

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No. 923.] SATURDAY, APRIL 17, 1841. [Price 3*d.*

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MILLS' SUBMARINE PROPELLERS.

Fig. 1.

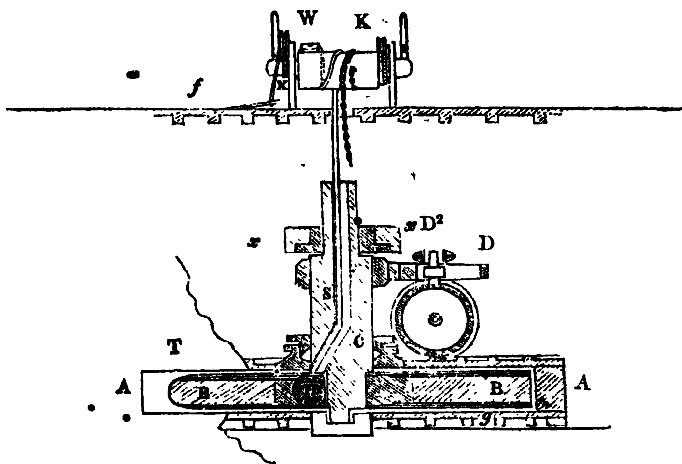
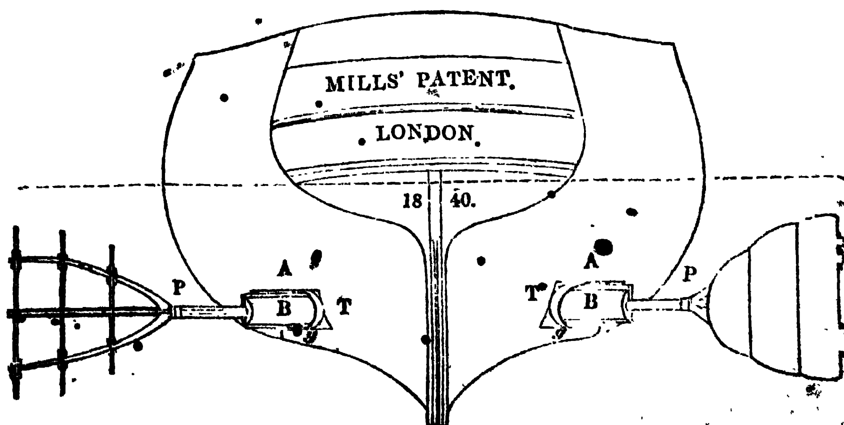


Fig. 2.



MILLS' SUBMARINE PROPELLERS.

[Patent dated September 21, 1840; Specification Enrolled March 21, 1841.]

The mode of submarine propelling invented by the present patentee possesses considerable novelty, and if the magnitude and weight of some parts of the motive machinery employed, prove no objection, will undoubtedly be most effective.

Fig. 1 is a longitudinal view, chiefly in section of a vessel fitted up according to Mr. Mills' plan; fig. 2 a stern view.

A hollow space or wheel case A A, is made in the middle of the vessel, considerably below the water line, open on both sides to the water, but perfectly water-tight above, below, and at stem and stern. Within this case a horizontal wheel B, separately represented in fig. 3, moves on friction rollers, *g g g*, having a vertical shaft, or axis, which passes through a stuffing-box in the top of the wheel-case, and works in metal bearings, one in the bottom of the wheel-case, and the other in a beam which extends across the vessel. This vertical shaft is by means of a connecting rod, connected with the engine, or other motive power having a reciprocating action. The horizontal wheel is composed of two iron rings E E, one at the top, the other at the bottom, having iron spokes F F, which extend from them to an iron nave G; the spaces between the rings and spokes are filled up with wood, and the whole is covered by a metal plate or plates on both sides, so as to exhibit the appearance of a solid disc, which fills the wheel-case, and projects a little on each side of the vessel. A hollow revolving shaft H H, with a rectangular bore for the reception of the paddle-shaft at each extremity, passes through the wheel from side to side, and turns freely therein. The end of the paddle-shaft which is inserted in the hollow revolving shaft, is made at the inner end of a circular form, and at the outer end next the floats of a rectangular form, having a link at the inner end, by which it is secured in its place. A rope or chain is passed down from a capstan or windlass K on the upper deck, through a channel in the body of the wheel-shaft, where it is drawn through an orifice in the hollow revolving shaft, and attached to the link of the paddle-shaft. The leaves or floats of each paddle-shaft, two or more in number, are suspended upon it loosely, by hinges, so that when moved through the water in a direction contrary to the line of motion of the vessel, they oppose their extended surfaces to it, and when moved in the other direction they open, and present their edges only to the water.

In adjusting the paddle-shafts, one of them (it is indifferent which) must be secured before the other, and must have its rope passed round the revolving shaft, by giving it one full revolution. The other paddle is then secured in its place with its rope passing direct to the windlass without any such coil; it follows that any subsequent turn of the windlass which causes the first to be uncoiled from the revolving shaft, will cause the other to be coiled upon it. A ready means is thus afforded for reversing the action of the paddles, for as each paddle rope is coiled or uncoiled to the extent of half a revolution of the revolving paddle-shaft, it causes the position of the paddles in the water to be reversed. The ropes are wound once round the windlass in opposite directions, and then drawn tight and secured; the windlass being held fast by a wheel-lock, of a new and very ingenious construction. This wheel lock consists of a back and front plate connected by a ridge or partition-piece in the middle; at the bottom there is a small toothed wheel which turns on an axis passing through the two plates; above this wheel there are two clutches, fastened by pin joints to the plates, their upper ends being pressed outwards by two springs; when the upper ends of the clutches are pressed outwards, their lower ends take into the teeth of the small wheel, and prevent it from moving either way; but when either of the clutches is pressed inwards the wheel is left free to turn in that one direction. This wheel-lock is attached to the frame of the windlass, and takes into a wheel fixed firmly to one end of the barrel of the windlass; a cord or rope is attached to the upper end of each clutch and passed through a hole in the top of the front plate of the wheel lock, whence it is carried down and fastened to a treadle attached to the deck; so that when it is desired to unlock the windlass, and turn it in either direction, all that is necessary is, to press down with the foot the treadle which commands the clutch sought to be unlocked, when the windlass may be turned round as required.

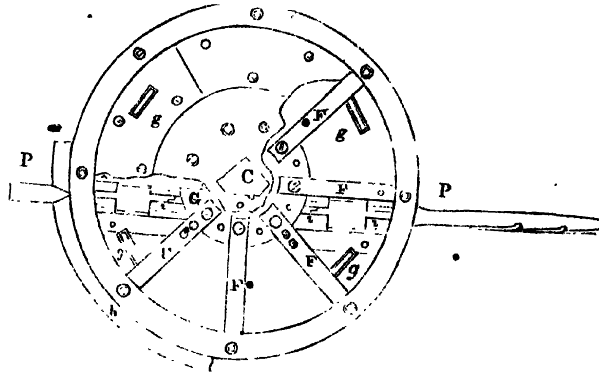
The horizontal wheel at each stroke of the engine performs about ½ of a revolution, so as to produce one complete sweep of the paddle shaft; the paddles act alternately, but it is stated, that in consequence of the motion being taken from the central axis, the vessel will be moved forward in a straight line.

In order to give the paddle shafts as much stroke as is productive of useful effect, and at the same time to exclude the water as much as possible from the wheel case, the angular corner spaces which are left unoccupied by the wheel are filled up with rollocking pieces, secured by screws.

Another simpler mode of constructing the wheel and attaching the paddle shafts is also shown; but in this case the paddles can only

be reversed by drawing them out and refixing them. Instead of the paddles with hinged flaps, a solid flat paddle may be employed, which is made to "feather" at the end of its

Fig. 2.



stroke, and oppose its edges only to the water in returning. [Mr. Mills' patent also includes some improvements in engines, but these we must reserve for the subject of a future notice.]

EXPERIMENTS AT THE POLYTECHNIC INSTITUTION ON MARINE PROPELLERS.

Sir,—In your No. 919 of the *Mechanics' Magazine* is a notice from a "Correspondent" having the above title.

I should not have intruded upon your valuable pages had not my name been mentioned, and the merits of my invention called in question.

I am sorry any person should be found capable of circulating that which is likely to lead the public mind astray on a subject of so much importance.

There were no "comparative experiments made," as your correspondent states—none at least that deserved the name; nor was it an appointed thing—I accidentally met Capt. Carpenter at the Institution. It is sufficient to say that my model was out of order, the wheel striking the paddle box, which, of course, retarded its progress through the water.

I am sorry your correspondent should put Capt. Carpenter's propellers in competition with Stevens's patent paddles. For the fact is, neither the screw nor Capt. Carpenter's propellers can have the least chance in contending with my patent wheels. I regret I am obliged, in self defence, to draw a comparison between the two inventions; the more so, as Capt. Carpenter's invention certainly has some merit, and I will do him the justice to say, that it is superior to the screw; but submarine propelling can never compete with side paddles, *where the power employed is equal in both cases.*

The trial alluded to, as I observed before, was not a fair one, inasmuch as the power I employ is not half that of Capt. Carpenter's; and your correspondent omitted to state that the vessel of Capt. Carpenter received no inconsiderable impetus from the hand when started; neither was my machinery adapted for the pool for a trial of speed.

The little model is now at the Poly-

technic, and will try her powers any day Capt. Carpenter may like to appoint, provided he has equal power, and I will stake ten pounds to five as to the result.

Perhaps it may not be amiss here to state that an experiment has been tried on a larger scale—namely, on a steam tug, with an engine of eight horses power, on the river Wear, in Sunderland, on a measured piece of water. The vessel was made to do her utmost with her own paddles, of the ordinary construction, which she performed in 20 minutes; the old wheels were then removed, and my patent wheels affixed, and the distance run under precisely the same circumstances, which she performed in 15 minutes. Another vessel, the *Don*, with an engine of 36 horses power, and fitted with my patent wheels, will be plying on the Tyne in a few days.

Had the steam ship *President* been fitted with these wheels, she would have performed her voyage in 9 or 10 days, and could not under any circumstances have been more than a day or two over time. The vast importance of this invention consists in giving nearly the same speed in rough as in smooth water; they are not half the usual width, make no back water, cause no vibration, and cannot get out of order, having no moving parts. It is extraordinary that the means of preventing such delay as in the case of the *President* are at hand, yet little or no attention is paid to it. With these wheels every voyage may be shortened nearly one-fourth; but all this is useless to state; John Bull, proverbially obstinate, turns a deaf ear to every new improvement. "He will be led," but "cannot be driven." Propose anything to him which is apparent to every one, and which his own common sense should immediately direct him to decide on, and he gravely shakes his head with an air of wisdom: "Ah! so many things have failed already; it looks very well, and I think it will do, but I wont adopt it"—and he is off in a canter. It is not the part of engineers, either, to recommend; for each has some little darling scheme of his own. But I am happy to say this does not apply as regards my invention to those whose names stand high in the profession, and who only wait until they can consistently recommend it, when they have promised to do so. Thus the case stands at present, and the opportunity of determining this important point will soon offer itself on the Tyne. Two vessels, of precisely equal power and equal dimensions and tonnage, the one fitted with common paddles and the other fitted with Stevens's patent paddles, will start on or about the 20th inst.; this will decide the case, and the general adoption of Stevens's patent paddles will, it is hoped, put to rest the present vain attempt to screw a boat to Jonathan.

I am, Sir,

Yours obediently,

J. W. STEVENS.

Woodford, Essex, 8th April, 1841.

ON THE CONSTRUCTION OF VELOCIPEDES.

Sir,—An amateur, whose communication on this subject, appeared in your 921st number (page 261), and who professes to have "paid considerable attention" to these matters, must allow me to put him right in one or two points, in which his views are singularly erroneous. He states that almost all the velocipedes hitherto presented to public notice, "have been constructed with an utter disregard of the most simple mechanical principles. Most of them have been propelled by turning a winch with the hand, and thus acting on the wheels."

Believing that I have paid fully as much attention to this subject as my brother "Amateur," I would beg to ask him where he has ever seen a single velocipede so constructed, and so worked? The only one worked by a winch that I ever saw, was that which I described in your last volume, p. 259. A design of my own for one to be worked in this manner, was published in your 818th number, but this cannot possibly be classed among those which "have been *constructed*," &c.

The fact is just the reverse of that stated by an "Amateur;" almost all the velocipedes hitherto constructed have been worked by treadles acted upon by "the weight of the human body." How any person who has paid the slightest attention to this subject, could have overlooked this fact, I know not.

As far as the *Mechanics' Magazine* alone is concerned, it exhibits notices of

Mr. Revis' "Aellopodes"*—Mr. Merryweather's Pedomotive Carriage‡—and Mr. Squire's Manumotive Carriage†—all of them actually *constructed,* and worked by the "important power of producing motion," which your correspondent tells us "has been entirely overlooked"! I have seen at least a score of others similarly worked, of which no published record is available, but of the actual existence of which, abundant evidence could be obtained if necessary.

Having entered thus fully into an ex-exposition of the true facts of the case, so far as the actual adoption of the one or other mode of working is concerned, I now proceed to notice the position advanced, that almost all the velocipedes "have been hitherto constructed with an utter disregard of the most simple mechanical principles."

All motion when produced by animals must be the result of muscular action; when the power of a man is applied to a winch or cranked axle of very small radius, its rotation is produced by muscular energy alone, the body being in a state of comparative quiescence; but where the winch is of a large radius, the weight of the body comes in aid of the moving force at one part of the revolution. The average weight of a man is rightly stated at about 140 or 150 lbs., and is asserted to be nearly equal, "if judiciously applied," (aye there's the rub) to the average draught of a horse in drawing a light carriage! It must be evident to all who are conversant with mechanics, that this weight, falling through a certain space will produce a certain effect; but having once fallen, it must be lifted again to its original starting point, before it can generate a similar useful energy. Well, how is it to be raised? By muscular effort alone; and the effort must be as much greater than the dead weight, as is sufficient to overcome it, and raise it to its original elevation. So that whether the muscular power is applied direct to a winch handle, or to the continual lifting the weight of the body, if an equal effect is produced, an equal degree of exertion must be exercised. It becomes, therefore, a mere matter of *choice* with individuals, as to whether they will use their arms or their legs as propellers for their "hobbies."

It is somewhat difficult to imagine what "class of persons" can possibly be alluded to, by "An Amateur," as being likely to use velocipedes, that would, more than any other "be speedily fatigued by any kind of labour *to which they had not been accustomed.*" Is there a single individual to whom this remark is not equally applicable? Therefore, every velocipede hitherto constructed, has remained a useless toy.

That important power, the weight of the human body, has been, perhaps, as judiciously applied in the "Aellopodes" of Mr. Revis, and the Pedomotive carriage of Mr. Richard Merryweather, as is possible, and the performances of each were highly satisfactory; that is, the speed obtained with a certain quantity of exertion, was quite as great as sound calculation would entitle us to expect. In both of these contrivances (as well as in many others) the weight was alternately thrown upon treadles acting on the cranked axles of the driving wheels. Another modification of a Pedomotive would be, by placing a tread-wheel behind a pair of large driving wheels, a spur wheel on the former taking into and driving a pinion on the axle of the latter; a hand rail should be placed for the *rider* to lay hold of while he continued "stepping up" the wheel. The tread-mill character of the affair is of no consequence, the motion of the mill would drive round the large wheels at a considerable speed, while the frame would be supported upon, and the carriage guided by, a stern wheel placed behind. The rider would in this manner soon leave the little boys behind who should sing after him, "Oh, such a getting up stairs I never did see," if—he belonged to the class not speedily fatigued by labour! At any rate there would here be no violation of "simple mechanical principles."

"Let a carriage be constructed," how you will, whether you propel it by the muscular energies of the arms or the legs, fatigue must inevitably result from working it; and if vehicles of this description are to remain useless toys till it is otherwise, toys they must ever be to the end of time.

Useless they must ever be to those

* Vol. xxxi, p. 18. ‡ Vol. xxxi, p. 104. † Vol. xxxiii, p. 174.

who, like an "Amateur," entertain the extravagant notion of being able (without fatigue) to "take out a lady or invalid for exercise."

Useful they may be, when properly constructed, and rationally applied; useful when used in reason for the legitimate object of moderate exercise, as I have pointed out in a previous communication.

In walking, the weight of the body is not perceptibly lifted; even the foot itself is elevated a very trifling distance from the ground; so that of all modes of progression, effected by the individual himself, walking must ever be the easiest.

While on this subject, I beg to offer a description of an improvement in locomotive chairs for invalids, which may be useful to "H. N." (page 68). Let the chair be mounted on a fixed axle somewhat towards the front; upon this axle place two wheels, each carrying a projecting ring on the inner side of the spokes, of a diameter a little less than that of the wheel; on a level with the invalid's hands on each side, place a small winch handle with an axis passing through the side frame of the chair, and having on the outside a small pulley or roller. A belt being passed round these rollers and round the rings on the wheels, the turning of the handles will cause a slow motion of the wheel, and, consequently, a traversing of the chair. The hinder part of the chair is supported upon a large castor, or a small wheel, turning freely upon a vertical pin. On turning both handles equally, the chair will advance in a straight line, but by turning either one or the other it can be guided to the right or the left; and it may in this way be turned round within its own space.

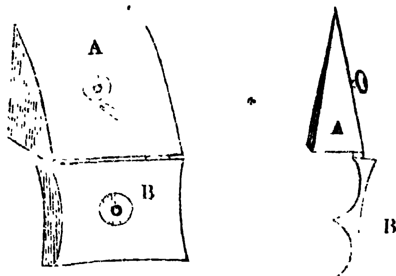
As easy and not rapid motion is the object required, it may in this manner be most effectually obtained, and a "merlin" thus constructed, would be greatly superior to that described at page 89.

I remain, Sir, yours respectfully,
Wm. Baddeley.

London, April 7th, 1841.

IMPROVED BLOWER FOR STOVE GRATES.

Sir,—With the view of adding my mite to the useful information with which your Journal abounds, I send you the following sketch and description of a simple and economical method of producing a good fire in a short time:—



A is a common drawplate, to which is attached, by hinges, an iron plate B, which together cover the whole front of the fire place. A little below the centre of B is a circular hole about 2 inches diameter, which, being produced, is at the same time contracted until the aperture does not exceed half an inch, and as the whole of the air necessary to support combustion, is necessarily obliged to pass through this small opening, a blast is produced, which cannot fail to rekindle even an expiring fire. Another evil which this contrivance is calculated to remedy, is that bane of the landlord, a smoky chimney, which may be effectually superseded by causing the plates to fit the fire-place moderately well.

I am, Sir, yours respectively,
J. W.

Birmingham, Feb. 2, 1841.

ON THE CALCULATION OF LIFE ANNUITIES. BY MR. GEORGE SCOTT.

(Continued from page 271.)

Sir,—Mr. W. Morgan, late Actuary of the Equitable, in vol. 2, page 443 (Price Morgan) makes the following candid statements:—

"During thirty-three years, from January 1768 to January 1801, the number of assurances on single lives had been 83,201, of which number 60,597 were on the lives of persons under 50 years of age, among whom the deaths were fewer than those in the *Northampton* Table in the proportion of 4 to 7. Between the ages 50 and 60 the number of assurances on single lives had been 15,779, and compared with the Northampton Table, the number of deaths had been as 5 to 7. Between 60 and 80 years of age, the number of assurances on single lives had

been 6,825, and among them the decrements compared with those in the Northampton Table were in the ratio 3 to 4, nearly."

Again, in vol. 1, page 183, he states more particularly—

"Compared with the decrements of life in the Table (Northampton) from the year 1768 to the year 1810, the decrements of life in the Society, appear to have been from the age of

10 to 20	in the ratio of	1 to 2
20 to 30	....	1 to 2
30 to 40	....	3 to 5
40 to 50	....	3 to 5
50 to 60	....	5 to 7
60 to 80	....	4 to 5 or at

all ages together in the ratio of 2 to 3."

From the above recorded facts we have ample proof of the enormous profits the different Assurance Offices must have had when the Northampton Table formed the basis of their calculations, on life assurances for given periods, or for its whole duration. Not but what the Northampton Table may have generally shown the true waste of human life among a body of people where good and bad lives are mixed together. But those who have the good fortune to obtain assurances on their lives do consist (for they have to undergo the ordeal of a medical examination,) of a *selection* of the best lives from the general mass.

The single premiums of assurance for equal periods of time, but for different ages, for the same sum and rate per cent. are nearly in proportion to the mortality for these equal periods of time. Thus the single premium for assuring 100*l.* on an age of 10 for a period of 10 years, interest 4 per cent., is £7.687, by the Northampton data: also by the same Table, the single premium for assuring the same sum at the same rate per cent., for an age of 20 for 10 years, is £11.797, and the ratio of mortality by the Table for these two ages, for 10 years, is expressed by the fractions $\frac{543}{5675}$ and $\frac{747}{5132}$; where, the denominators express the number living by the Table at the age of 10 and 20, and the numerators, the numbers that die between the age of 10 and 20, and 20 and 30, or $\frac{543}{5675} : \frac{747}{5132}$ 100 152; that is, the ratio of the waste of life between the ages of 10 and 20, is to the waste between 20 and 30 (by the Northampton Table,) as 100 to 152. Now 7.687 : 11.797 : : 100 : 153; that is, the single premiums for equal periods of time; but different ages are very nearly in proportion to the mortality for these equal periods. Again,

The single premiums computed from different tables of mortality, for the same sum, age, rate per cent., and period of time, will also be very nearly in proportion to the mortality exhibited by the two tables for the same period of time. Thus, by a similar process by M. De Parcieux's Table of Mortality—formed from the lists of the French Tontines—for every 100 persons that die by his table, between the ages of 40 and 50, the mortality by the Northampton Table for the same ages and period, gives 183 deaths. We have computed the single premiums for assuring £100 at 4 per cent. from both tables for the said ages and period of time, and find them to be, by the French table £9.448; and by the Northampton, £17.345. Hence, £9.448 : £17.345 : : 100 : 183⅓, and hence the single premiums are very nearly in the ratio of the waste of life shown by the two tables.

The following little table will exhibit Mr. Morgan's comparison of the waste of assured or selected lives, and that by the Northampton Table.

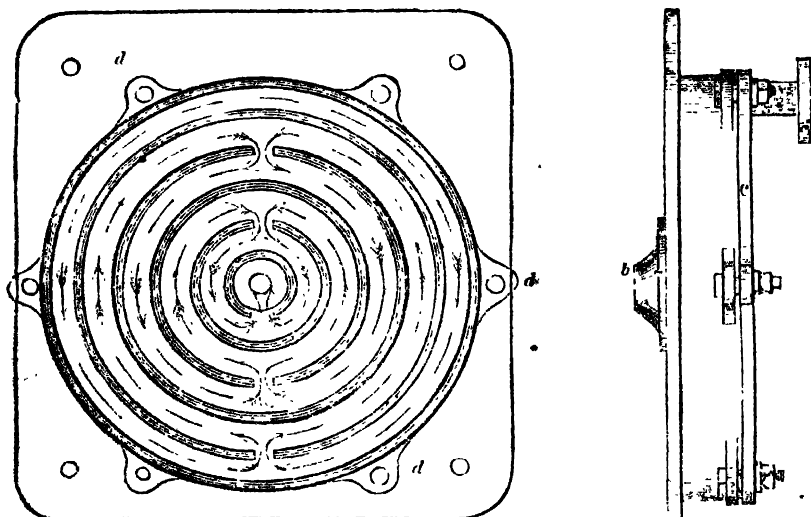
Table I.

	For every 100 deaths of those assured in the Equitable.	The deaths by the Northampton Table on mixed lives, will be
From 10 to 20	100	200
—— 20 to 30	100	200
—— 30 to 40	100	167
—— 40 to 50	100	167
—— 50 to 60	100	140
—— 60 to 80	100	125

(To be continued.)

IMPROVED FORGE-BACK.

Sir,—I beg to hand you a design for a forge back, which I think would be very useful to smiths, iron-founders, &c. as it would combine the advantage of the use of the hot-air blast with that of preserving the iron from the destructive effects of intense heat. I lately saw one of West's patent forge backs, a description of which appeared in your Magazine some months since, and after I had examined it, imagined the desired ends might be attained by a more simple apparatus, and that, too, without the waste of heat, and, consequently, of coal, which in spite of the inventor's statement, and long roll of flattering certificates, must inevitably be attendant on the use of West's, the iron in which is continually absorbing heat from the fire, and transmitting it to the water, which is carried off by a pipe to be cooled, again to return and carry off more. Independently of the above named fault it possesses another—viz., that of being exceedingly cumbersome; it requires a cistern or water butt, pipes, &c. to complete it. The construction of the one that I beg to lay before your readers will be understood by a reference to the sketch. Fig. 1 is a back view, with the outside removed



in order that the channels may be seen. Fig. 2, a side view. The air first enters at the pipe *a*; its course towards the fire is shown by arrows. It will be observed that no heat is wasted, as what the air receives from the iron is again returned to the fire *b*, the hole open to the fire. The apparatus may be conveniently made in two parts, the plate *c* being secured by bolts to the ears *d*, clay or some other suitable substance having been previously laid on the parts marked *e*, forming the sides of the channels, so that the passages may not communicate with each other, excepting by the proper inlets.

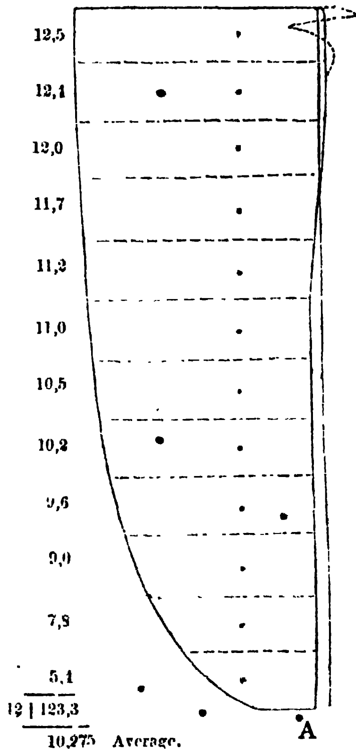
Hoping you will oblige me by inserting this in your highly esteemed periodical,

I am, Sir,
Your obedient servant,
A. Bellum.

Hayle, February 29, 1841.

EXPERIMENT WITH MC NAUGHT'S STEAM INDICATOR APPLIED TO A LOW-PRESSURE ENGINE.

Sir,—The subjoined is a diagram drawn by one of McNaught's Low-Pressure Steam Engine Indicator, when applied to the cylinder of the engine employed at these works. The diameter of the cylinder is 16¾ inch; the length of stroke 36 inches; the number of revolutions per minute 40. A in the diagram represents the atmospheric line.



I took care to have the indicator clean, and as free from friction as possible; the pencil bore lightly upon the paper and made a very faint mark, which to render more distinct and permanent I ran over with a pen and ink.

You will see that I have divided and taken twelve measurements of the diagram, and make the average pressure on the piston per square inch 10.275 lbs.

Perhaps it may be proper to say, that the engine is of that description called a "Beam Engine," having a common box slide valve (such as is generally used for high-pressure engines,) worked by means of a stud fixed on a face plate at the end of the crank shaft.

At the time the diagram was taken the engine was driving a blowing-fan for the cupolas, 4 feet diameter, another of 3 feet diameter for the smithies, one small planing-machine, five lathes, and two grindstones for the turners, besides the shafting, &c., which consists of one upright and two horizontal shafts, also a heavy shaft for driving another room which strap was running on a loose pulley at the time; six other straps for three lathes, one upright drill, and one screwing-machine, also on their loose pullies, and an intermediate shaft driven by a pair of spur wheels for getting up the speed of the 4 feet fan.

If you think it worth the trouble I shall be glad to see at your convenience this mite in a corner of your valuable journal, and remain

Yours respectfully,

M. Noton.

Irwell Foundry, Stanley-street, Salford, April 7, 1841.

THE SMOKE NUISANCE—MR. ARMSTRONG IN REPLY TO MR. DIRCKS.

Sir,—Perceiving that Mr. Dircks has thought it worth while to transmit you a copy of a communication of mine to the *Liverpool Mercury*, containing suggestions for getting rid of the nuisance of smoke in certain cases, together with a critique of his own on my plan, both of which you have thought not too unimportant to republish in your interesting Magazine, I am in consequence induced to ask the favour of your inserting my reply to that gentleman's letter.

Such is the hot and sanguine temperament of inventors generally, and of smoke burners in particular, that they can seldom afford to allow their projects to cool sufficiently for a calm investigation of their merits. Like the rest, Mr. D. and his patron have both shown a strong disposition to "holloa before they are out of the wood," and like many other schemes of the same genus, theirs seems to have gone dead before there was time to have it properly condemned.

I am, Sir, yours respectfully,

R. Armstrong.

Mr. Armstrong's letter to the Editor of the Liverpool Mercury.

Sir,—The objections of your correspondent, Mr. Henry Dircks, to my proposed *unpatented* plan for preventing the nuisance

of smoke, and the reasons he gives for preferring what he naturally enough considers the "more natural and rational" *patent* plan of Mr. Williams for effecting the same object, (in which, it appears, he is personally interested,) call for a few explanatory remarks from me. In order not to trespass at too great a length on your valuable columns, I shall endeavour to be as brief as is consistent with the necessity of in some degree anticipating similarly unfounded objections on the part of others. My object shall, therefore, be to assist in enabling your general readers to form an impartial opinion respecting the two plans in question, rather than to write a formal reply to your correspondent, much as his letter invites comment.

Mr. Dircks asserts that Jeffrey's plan of condensing smoke has already been tried in Liverpool, and failed,—although, in the absence of any reference whatever to the where and the when of the experiment, I may be permitted to doubt the alleged fact, more especially as I find Mr. Dircks errs in his statement that the patent for it expired only last year; for, on reference to the list of patents for 1824, I find it is dated October 7th of that year; consequently, it must have expired in the year 1838. But, granting that the original plan of Mr. Jeffreys may have failed, it does not follow that the plan I have proposed, which involves considerable alterations in the practical application of the principle, must also be unsuccessful, as I expressly described in my former letter some details of which the original plan was deficient, but which details, or some modification of them, are absolutely necessary to its success.

The description I gave you of my improved plan was evidently intended by me merely as a popular explanation of its general features rather than instructions for carrying it into effect, for it is easy to conceive that where the chimney already erected is of sufficient width there is no necessity to build an additional shaft. It is, then, only necessary that a nine-inch wall should be run up inside, dividing the chimney into two equal portions, and this wall need not be higher than the roof of the building with which the greater number of chimneys are usually connected. The roof of ordinary engine-houses or factories will also be of amply sufficient elevation on which to place the water cistern; this cistern being external to the chimney, it will be found that a common cask of moderate dimensions will serve the purpose, if it be made to communicate by a small pipe with the cullender intended to distribute the shower of cold condensing water within the downcast shaft. Surely there can be nothing of the difficulty which Mr. Dircks effects to apprehend, either in this or any other arrangement for carrying out the plan. Various other modes of effecting the same object, suitable to the local circumstances of each case, must immediately present themselves to the mind of any practical "engineer" deserving the name, that would certainly be neither "elaborate" nor "expensive."

With respect to plans for *burning* the smoke, or, in the scientifically precise phraseology in which their respective inventors and patentees usually delight to speak of them, *destroying smoke by "combustion,"* I have to remark that the chief objection to them is, that they nearly all require the admission of a large quantity of cold undecomposed atmospheric air direct to the body or chamber of the furnace—that is, air which has not passed through the ignited fuel on the fire grate, and, consequently, containing its full supply of oxygen, without which neither smoke nor any thing else will burn, a fact well known now-a-days to the merest tyro in any mechanics' institution, without his having absolutely "studied" Mr. Williams's book on the atomic mysteries of "chemical combustion."

Now, the evils arising from the admission of cold air to the furnace chamber of a steam-engine boiler are numerous; it not only checks the generation of steam, by impinging against, and cooling the heating surface of the boiler, but it also checks or diminishes the velocity of the draught of air passing through the fire-grate, by lowering the temperature of the column of air in the chimney, on which the draught itself entirely depends, thus lessening the intensity of the heat in the fire-place, and thereby, in effect, diminishing the evaporative power of the boiler. But the bad consequences of admitting air in this way are far from being confined to the want of economy in the process; that with which the public, who wish to get rid of the nuisance, is most concerned, is, that the impediment which this plan throws in the way of the firemen keeping up the steam, prevents the process, such as it is, from being used at all. All sensible operative engineers have the greatest dislike to it, and for good reason; for, setting aside the continual danger arising from the explosion of fire-damp in the flues they say, and say truly, that the act of letting in the air, converts the close *air furnace* at once to the state of a common open house fire;—it is then, in fact, no longer a *steam-engine furnace* at all. The peculiarly unhappy illustrations for his side of the argument, which Mr. Dircks uses, of "a torch and an argand lamp," may be appropriately extended, by saying that the

heat-giving properties of the furnace in its ordinary state, when compared to those effects in its smoke-burning state, are exactly in proportion to the heat obtained from an argand, or any other lamp, by means of the blow-pipe, compared to that obtained from the same lamp without one. In the former case, less *light* is obtained, it is true, as is still more strikingly exemplified in the case of the oxy-hydrogen blow-pipe; but it is *heat*, and not light, that we are wanting in a steam-engine furnace.

The simple fact that light is not a necessary concomitant of great heat, seems to have been entirely overlooked by Mr. Williams, as well as by the three or four learned professors whose testimonials he has published; for they all seem to take it for granted, that the fire-grate of a steam-engine furnace is nothing but a kind of retort for the destructive distillation of coal. When such notions are acquiesced in by such men as Professor Brande, it is no wonder that Messrs. Dircks and Williams consider the furnace chamber to be a sort of argand lamp. All the arrangements connected with the experimental boiler and furnace on the patent "combustion" plan, put up for public inspection at Messrs. Dircks and Co.'s works, in Vulcan-street, are entirely conformable with this erroneous idea. I took occasion to look at this specimen of the patent furnace only yesterday, and such a peep-show business certainly I never saw before. There are a number of holes for looking through into the flues, in order to see the "chemical combustion" going on, each hole being furnished with something like the eye-piece of a telescope with glass in it. When the air-holes are opened the smoke is inflamed certainly, and so it is when the furnace door is left open for a space of two or three inches, but with less danger; this I had the satisfaction of proving demonstratively at Mr. Dircks's works yesterday; and any one, whether engineer or not, may do the same. Let them shut up the patent smoke-burning holes which admit the air, and open the furnace door a small space instead, and they will find that exactly the same effects are produced as before, namely, less smoke *and less steam*.

This great and fatal defect of a diminished production of steam, occasioned by diminishing the draught of the fire, was expressly stated in my former letter, but which, in his anxiety to puff his own pet scheme, Mr. Dircks has not thought it convenient to notice. It is, however, important that the attention of all who really feel interested in the permanent removal of the smoke nuisance should be particularly drawn to the fact, as it has always been the great stumbling-block of nearly all practical smoke burners; and in no one plan that I ever met with is the almost insurmountable nature of this difficulty more conspicuously illustrated, both in theory and practice, than in that of which Mr. Dircks has assumed the championship.

Fearful of trespassing too far on your indulgence this week, I shall, with your permission, return to the general subject of my former communication in a future letter.—Yours, &c.,

R. ARMSTRONG.

Manchester, Feb. 16, 1841.

NECESSITY FOR A FIRE POLICE IN DUBLIN.

(From the *Citizen*, a Dublin Monthly Journal.)

(Concluded from page 299.)

In the mean time the alarm is to be given at *many different places* by any individuals who may chance to think of it—

1. To the fire offices for the engines, chiefly in or near College Green.
2. To the Paving Board Office in Mary-street for the water carts.
3. To the pipe water establishment in William-street or in Barrack-street for the turncocks.

There is a portable fire-escape apparatus at each of the police divisional stations, but it does not appear whether their service is thoroughly organized, so that they may be run out with rapidity on all alarms.

The first body in readiness to act, is the police: and it is stated by one of the superintendents, that on one occasion, if he and his men could have got a few buckets of water on their first arrival, they could have extinguished a fire, that, in the end, did damage to the value of 1,500*l.*

The first engine will arrive in from half to three-quarters of an hour after the fire is observed, and the filled water carts in from three-quarters of an hour to an hour. The latter cannot be moved at any accelerated speed.

The turncocks as soon as they are warned, proceed to turn the water into the branch pipes nearest to the fire. A great portion of the water, in the first instance, makes its way into various cisterns and other receptacles, which, of course, will retard the supply for the fire engines. The turncock then proceeds to the spot, and searches for the pipe, which is to be *broken into* by a sledge hammer, for letting out the water. Sometimes a gas pipe presents itself first, and is broken before it is known not to be that required. The water is then obtained out of the dirty hole as well as may be; the whole operation taking much time, and executed at almost every fire in the barbarous manner here described.

At length the engines get into full operation, but not until the fire has had a very long time to increase in extent and intensity.

It can be hardly necessary to advert to the bad principle of many of the above arrangements, or to the want of that unity and rapidity of preparation and action which is so essentially requisite in such a matter.

To remedy the great want of system, and of proper means, that are at present applied to this very important service, and to provide the necessary assistance in the most prompt, efficient, and at the same time economical manner, the following principles are suggested for adoption:—

That the insurance companies be relieved from any connection with the business of extinguishing fires. The insurers would by degrees have the benefit of this reduction of expense, and of the diminution of risk which an improved system would produce. Insurance would be cheaper, and consequently more general, and the interests of the companies would be improved, and in particular during the state of transition, as the reduction of the rates would only be according to the encreasing profits of the insurers.

That there be formed a district fire guard, to be supported by general assessment on the city; which assessment would probably not exceed 4d. in the pound of value, that is, less than a shilling per pound added to the present police tax.

To avoid the necessity of an additional establishment, and to enable it to be of efficient numbers without the greater part being for long periods idle, this guard should be incorporated with, and form part of the metropolitan police, every member of it being liable to any police duties: in short, that such portion of the police force (to be encreased to the extent required), and such individuals as the commissioners found necessary, should be allotted to any peculiar part of this service.

The whole police force would receive some degree of instruction on the manner of conducting the operations; but one good general superintendent and a few assistants would be required, to keep all the machinery in perfect order, and who would have a more perfect knowledge of the best manner of proceeding, and how to obtain and apply in the most prompt manner every necessary object and assistance.

In London the fire establishment consists of one superintendent and ninety-five men, with fourteen stations, at which are kept thirty-two engines, besides the two large floating engines on the river. This is little enough, but there must be a great desire to reduce the force to a number that will find full occupation. As this business, however, is very irregular in Dublin, at times requiring great exertions, at others much less, it would be of much advantage to have a body, the members of which applicable to this particular service, would be encreased or reduced, according to the necessity of the period.

In Liverpool the numbers are, one superintendent, one assistant, and sixty firemen, the whole being constables, and part of the police force, as recommended for Dublin.

It is probable, that on such a system being organised, the Insurance Companies would give up their engines to the new establishment, but if not, engines must be purchased.

The engines and other necessary apparatus, would be connected with divisional police stations, in the proportions and manner best suited to the importance of the respective positions. Arrangements might be made for turning out the engines rapidly, and would not be so difficult or expensive as might be imagined; agreements might be entered into with persons in the neighbourhood, engaged in any business requiring them to have constantly a number of draft horses present, as is done at present by the National Insurance Company, who have an undertaking from a miller near where their engine is kept, at 30*l.* per annum, and 8s. each time called out, to produce a pair of strong horses within five minutes after being called, under penalty in case of failure. It is probable also that it might be so arranged that the horses belonging to the Paving Board might be made available, so far as they would go, for this service.

At each station, there should be kept a good fire escape, the service of which should be thoroughly organised. It should be run out at once on every alarm.

The contrivances for the saving of life, and the means of applying them with the necessary rapidity, have not kept pace with the arrangements for the saving of property. The necessity for their use is indeed much less frequent, but still there is no excuse for not being always prepared for the contingency; and however rare, the gratification must be very great of at any time applying improved means with success, where but for them, fatal consequences must have been inevitable.

At every station, and perhaps even at other places available to the police, might be kept, in addition to the great engines, one smaller and more portable, either such as the present parish engine, or other of approved pattern. These small engines might be earlier on the spot. They may be frequently taken with much advantage into passages and confined places that are impracticable to the others, and with a moderate supply of water in the early stages of a fire, might be the means of extinguishing it.

We come now to the really important con-

sideration, of the means of obtaining a supply of water rapidly.

The pipes for the conveyance of water through the town, from the basins connected with the two canals, have been arranged solely with reference to the provision for the houses. The principal mains, which are constantly full, besides being small in dimensions are, of course, few and far between. From them, the intervening quarters of the city are supplied by union branch pipes, through which the water is turned periodically for filling the several house cisterns.

The first great desideratum is to have numerous fire plugs established in all parts, so that the very slow, wasteful, and barbarous mode of cracking the pipe with a sledge hammer on every occasion, may not be resorted to. Whenever the fire should break out near one of the principal mains, the police, who should always have keys of the fire plugs at their several stations, would be enabled to procure the water even before the engines would arrive. But if the fire should break out within reach of only branch pipes, some time must elapse before it can be obtained, even although the police had also keys for letting the water on that particular part, because, in the first instance, a great portion would be absorbed in filling all the house cisterns in its passage, which would very much retard and reduce the supply, unless by accident the fire happened at the period when those precise branches were filled for the ordinary service. It is this which usually occasions the great delay in getting water, causing so much complaint and injury.

The desideratum is, therefore, to devise the best expedients for a supply of water from the very earliest periods, that assistance by men and engines can be given, for about one hour or an hour and a half, by which time it can usually be obtained from the street pipes. It is presumed that any general reorganization of the water pipes, so as to be effective for this object, is hardly to be expected. The following, however, might afford a partial remedy:—

1. To collect an establishment of carts at each station to convey a limited quantity of water out rapidly with, or even before, the engines, if possible.

Those belonging to the Paving Board are, at the present time, extremely useful, as they usually convey and keep up the earliest supply; but they are all in one depôt, and are of a construction quite unfit for any but very slow progress, the water being all in bulk in one cistern.

For rapid movement and for the most useful application, it should be in kegs, such as one man could conveniently carry on his shoulder, say four gallons each, a suitable number, perhaps twenty, on each light one-horse cart, the kegs being kept constantly filled till required. Such carts might be taken out in a gallop in any direction, and the kegs conveyed by hand to any part of the premises in danger. In the mean time the present heavy water carts would come in very opportunely, and both kinds be employed in successive trips to the nearest fountains or places of supply, until the action of the street pipes was in full operation.

2. The police should make themselves perfectly acquainted with the cisterns, pumps, &c., in all the premises in the city, so as to understand thoroughly, what resources might be made available in that way, and the fire apparatus might be provided with such buckets, pipes, hose, small pumps, &c., as would be most useful for collecting it.

They should have such powers to take water from houses, and generally to enter premises in or near the danger as may be considered proper, and must depend for the rest on obtaining leave from the occupiers, which, it is probable, would seldom be refused to a body of public servants so well known; but under either case, it is very desirable that they should have a thorough knowledge of what resources might be so obtained, and the best means of getting at them.

In like manner, they should be well acquainted with all the localities, with reference to the best way of bringing the means to bear on a fire, and where the engines, &c. can be taken to advantage.

3. There would still be an important lapse of time between the supply brought to the spot by the carts, and the regular current to be obtained from the street pipes. At present the water carts proceed to the nearest fountains available, which are only those on or so near the principal mains as to be constantly provided, or those on the branch pipes that happen to have the water turned on them at the time. These resources are so rare, as in many parts of the town must occasion much delay, and but a very slow service.

It is suggested that a useful remedy might be applied by the establishment of cisterns in different parts of the city, to be kept constantly filled for this express service. They might be on two systems, either above ground in open spaces, made of stone or iron, in form of pedestals to columns, round or square, and to contain from 4,000 to 8,000 gallons, and might be raised sufficiently for the water to run into the carts; or they might be under ground, of brick and cement, but would require in that case to be pumped out. The latter would have the advantage, however, of being cheaper to construct, completely out of the way, and might be

made much larger without difficulty, and be more protected from the effect of frost.

The above very imperfect sketch is not intended to prescribe details of any value, but to suggest what it is conceived would be the *principles* desirable to be acted upon.

1. That an ample and well organised fire police be established, and constantly ready to act with rapidity; as the necessity for them is only occasional, and may at any time, without previous warning, require more or less means. It is assumed that this can only be done with economy, by making it a branch of the active metropolitan police.

2. That the body charged with this service be thoroughly acquainted with the business—that they be invested with a certain degree of authority, and have full power to bring all the necessary means at once into activity, without the presence or intervention of any other persons.

3. That the most perfect machinery be established in the several parts of the city most suitable, in connexion with this body, and under their charge.

4. That the most complete arrangements be made for obtaining water, at the early periods of the occurrence.

It is suggested, that considering the importance of the object, the expense would not be great, of obtaining all the improvements that have been here proposed. It might not be unreasonable to calculate, that in the course of the next three years, the value of property that would be saved by such precautions would more than pay for the first outlay.

It is supposed that there could be no difficulty in effecting so perfect a co-operation between the police and the pipe water, and the paving boards, as regards this particular service, as would give the full benefit of all the means that could be furnished by the two latter, and of putting those means on such temporary occasions at the disposition of the police, without the necessity at the moment for applying to those distant offices.

On this subject it is not possible to omit the very natural suggestion of the propriety and economy of consolidating pipe water, paving, and wide street departments, into one body, all being municipal establishments, and with duties necessarily very much connected.

J. F. B.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JAMES STIRLING, OF DUNDEE, ENGINEER, AND ROBERT STIRLING, OF GALSTON, AYRSHIRE, D.D., *for certain improvements in air engines.*—Enrolment Office, April 1, 1841.

The engines referred to in this patent are those in which motion is obtained by the alternate expansion and contraction of air, by the application or abstraction of caloric.

An "air vessel" is formed of cast iron, and connected by a port and pipe with the top of a cylindrical cast iron vessel called the "plate box;" the air vessel also communicates at its lower part with the plate box by three or more parallel pipes, which terminate within the air vessel in fan shaped orifices for the purpose of rapidly spreading the air over the whole extent of spheroidal face of the air vessel. An air-tight cast iron vessel called "the driver," occupies $\frac{5}{8}$ths of the air vessel, and in order to prevent heat from ascending, this driver has a cast iron plate fixed outside its bottom, and in its lower part is placed a quantity of brickdust or other non-conducting material; the remainder of the interior is divided into 12 or 16 compartments by thin iron plates. The driver is made to fit the bored part of the air vessel, so as to move easily up and down, but not to allow air to pass by its side; its upper and lower end are so formed as to fit the top and bottom of the air vessel. The driver is moved by a piston rod passing through a cupped leather collar, fixed on the top of the air vessel, in which also there is a pipe descending into a vessel of oil, so as to prevent access of air to the collar, and thus make the joint air-tight. Another kind of driver consists of an outer shell of cast iron, accurately turned and fitted to the air vessel, and having a number of holes pierced in its bottom for the passage of air; upon the bottom of this shell rests a piece of cast iron, similarly pierced, having small ridges on its upper surface to support a number of plates and facilitate the distribution of air among them; these plates consist of alternate sheets of plain and fluted glass, in narrow strips not exceeding an inch in width, which accurately fill up the interior space of the driver. At a small distance above these plates is the cover, which is perforated with small holes for the transmission of air, and is attached to the outer shell by a ring of sheet iron.

The "plate box," about $\frac{2}{3}$ from the bottom, is filled with perpendicular plates of iron, kept at $\frac{1}{40}$ of an inch from each other by ridges; the remainder of the plate box is occupied partly by blocks of iron, glass, or other solid bodies, and partly by a refrigerating apparatus, composed of a great number of copper pipes, through which a stream of cold water circulates, arranged in 21 horizontal rows, at a distance of $\frac{1}{20}$ of an inch apart. These pipes are soldered into two brass plates, and to these two other plates of brass are soldered, having horizontal passages at their four margins for connecting the ends of the pipes, and returning the water from one end to the other, furnish-

ed with larger passages for introducing and carrying off the water. The main pipes pass through holes in the cover of the plate box, made tight with lead packing.

The *modus operandi* is as follows:—The bottom of the air vessel, the parallel pipes, and the plate box, are heated by a fire underneath, until the soot is burned off and ceases to adhere; if the driver is then moved upwards, it will diminish the space at the top of the air vessel, and enlarge that at the bottom equally, which causes a portion of air to pass downwards through the plate box into the heated part of the vessel, being there heated and expanded, it is more than sufficient to occupy that space, and is forced out at the port. On the contrary, when the driver is moved downwards, a quantity of air is made to ascend through the cooling apparatus in the plate box, and being cooled and contracted, it is insufficient to occupy the increased space at the top, and a quantity of air must enter by the port to restore the equilibrium. One of these air vessels being placed at each end of the working cylinder of an air engine, is set in motion by the foregoing expanding and contracting of the air

The claim is to—1. The employment of strips or rods of glass for receiving and imparting heat, during the passage of air from the hot to the cold chamber, and *vice versa*.

2. The formation of the glass, iron, or other materials employed for this purpose, into continuous plates, strips, or rods of considerable length, having their contiguous surfaces so placed as to make all the passages for the air narrow, and in a line parallel, or nearly so, with the axis of the plate box or driver.

3. The mode of constructing air engines, whereby the air, in passing from the heated end of the air vessel to the cool end thereof, is caused to pass first amongst an extensive system of surfaces to give off heat thereto, and then to pass amongst an extensive cooling apparatus, cooled by the passage of fluids, whereby the air, in returning from the cool end of the air vessel to the heated end thereof, is caused to pass through the same extensive system of surfaces, and having taken up heat from those surfaces, to pass into the heated end of the air vessel.

4. The use or application in air engines of cupped leather collars around the piston rods, or other rods, which communicate with the interior of the engine, by which means the air is enabled to be confined at a high pressure.

William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., *for improvements in producing or obtaining motive power.*—Enrolment Office, April 1, 1841.

A strong metallic vessel is provided, of the ever memorable "black bottle" shape, the part corresponding to the neck of the bottle, being a cylinder fitted with a piston, and the ordinary appendages for communicating motion to a crank shaft in the usual manner. This vessel is filled about half way up with water, or with water slightly acidulated to facilitate its decomposition. A pair of wires enter that part of the vessel which is occupied by the fluid, on opposite sides, and terminate in two metal plates a short distance apart. These wires are to be properly insulated at their insertion into the containing vessel. Above the part occupied by the fluid, there are another pair of wires, connected together by a very fine wire of platinum. The upper and lower pair of wires are alternately connected with, and disconnected from the positive and negative poles of a galvanic battery; the ends of the wires terminate in springs which press upon the circumference of a revolving metal shaft upon which a fly-wheel is mounted; part of the metal is removed from the circumference in places, and filled up with wood, bone, or other non-conducting medium, so that the springs continually pressing upon the revolving surface are alternately in, and out of connection with the battery.

By means of this arrangement an electric current is first passed through the lowest pair of wires, which being spread over the extended surfaces of the two plates, decomposes the water, oxygen being evolved from the one plate and hydrogen from the other; this connection is then, by the revolution of the shaft, broken, and the current passed through the upper pair of wires, when the platinum wire becomes red hot and inflames the gases. The evolution of the gases caused an upward, and the explosion produces a downward motion of the piston.

A second arrangement for producing power, is described as follows:—A large soft iron horseshoe, surrounded with helical wires, is placed perpendicularly in a square case or frame, to the top of which a long lever is jointed; at a short distance from this fulcrum an armature is attached. At the other end of the lever there is a small hole through which passes a connecting rod from the crank shaft of a fly wheel; this rod terminates in a knob or stop, so that as the crank approaches the upper part of its circuit the lever and armature is raised; but as the armature has but a very limited range of motion, as the crank descends the armature rests upon the horseshoe, and the connecting rod continues its progress passing freely dowawards through the hole in the lever.

Two wires proceed from the helix to the opposite poles of a battery, the connection with which is made and broken by a revolving shaft as before. On the connection being made, and the crank being in its highest po-

sition, the horseshoe becomes magnetic and strongly attracts the armature which brings down the lever, crank, etc., as soon as the armature is in contact with the magnet it stops, but the crank continues its motion, and the electric current is broken, leaving the armature free to be raised by the impetus originally communicated to the fly wheel. In the same way a succession of magnets and armatures may be so arranged as to act one after the other, and constitute a continuous force throughout the whole downward motion of the crank.

Another mode of producing power, set forth, consists of an inverted syphon, the left leg of which is cylindrical and fitted with a piston; the lower part of the syphon is filled with oil, water, mercury, or other dense fluid; the upper part of the right leg is filled with carbonic acid or other gas. By means of suitable wires an electric current is capable of being passed through this fluid, by which it is heated, and, expanding, raises the piston. As the piston reaching the top of its stroke the electric current is broken, and the gas contracting to its original limit, permits the piston to descend, when it is again raised by the same means as before.

The claim is to—1. The method of obtaining motive power by the alternate evolution and combustion or explosion of gases, the said evolution being caused by the decomposition of a liquid by the voltaic current, and the said explosion being also caused by a voltaic current.

2. The disengaging the armature from the rest of the engine at the proper moment for obtaining the above mentioned effects.

3. The employing of the mutual attraction of an armature and magnet so as to bring a second armature and magnet within the influence of their mutual attraction (the first armature being stopped without impediment to the action of the engine) and similarly the employing the two first ones to bring a third armature and magnet within the influence of their mutual attraction, and so on in succession for any larger number. Thus augmenting the (otherwise small) distance to which magnetic attraction (of a powerful kind) extends itself.

4. The method of obtaining motive power by the pressure of gas, or liquid, or the vapour of liquid, or any of these combined: such pressure being caused by heat communicated to them internally, and then withdrawn, or diminished at regular intervals, by means of a voltaic battery.

ROYAL MAIL COMPANY'S STEAM PACKETS.

Sir,—Perceiving in No. 918 of your valuable journal a notice of the Royal Mail Company's Steam Packets, perhaps you will excuse the liberty I take in correcting a slight error you have made in stating that the "Sesostris" was the *chef-d'œuvre* of Mr. Pitcher, from which it will naturally be inferred that she was constructed by that gentleman, whereas, the drawings from which she was built, were given by Messrs. Ritherdon and Carr, surveyors to the East India Company.

The Mail Company's packets now building by him are, however, from his own drawings, and totally different from the "Sesostris." I subjoin the dimensions of the Royal Mail Steam Packet Company's packets as building by Messrs. Pitcher, White, Menzies and Paterson. The others are from different lines.

	ft.	in.
Length between the perpendiculars	213	0
Breadth, extreme	35	6
„ moulded	34	10
Depth of hold	23	0
Height of spar deck	7	0

1285 tons builders' measurement.
450 horse power.

The *Thames* will be the first launched in the river, which will, in all probability, take place the first week in May. Your obedient servant,

SHIPWRIGHT.

NOTES AND NOTICES.

Sounding the Sea by Electro-Magnetism.—Electricity is daily extending its sphere of operations, and is becoming more and more extensively applicable to useful purposes. We have this week seen an ingenious apparatus contrived by Mr. Bain, the inventor of the electrical clock, for the purpose of taking soundings at sea by electro-magnetic power. At present great difficulty exists, when taking soundings in deep water, in ascertaining the exact time the weights strike the ground. The object of Mr. Bain's contrivance is to obviate this difficulty, and he accomplishes it in the following manner:—To the bottom of the hammer of a bell is attached a piece of soft iron, which is placed opposite an electro-magnet; and it is so arranged that when the communication between the coils of wire round the magnet and galvanic battery is completed, the magnet attracts the iron and holds back the hammer. As soon as the connexion is broken the magnetic power ceases, and the hammer, acted on by the spring, strikes upon the bell. This part of the apparatus is intended to remain on the deck of the vessel when the soundings are made. The insulated wires from the galvanic battery, properly protected from the action of water, serve for the cord to which the weight is to be attached.

When the pressure of the weight bears on the hook, the electrical current is interrupted, and the magnet keeps the hammer from the bell; but when the weight rests on the ground the connexion is broken, the attraction of the magnet instantly ceases, and the hammer, being thus liberated, is forced against the bell by the spring. It thus indicate with the utmost precision the moment the weight reaches the bottom of the sea.

Errata.—P. 263, first column, 53th line from the bottom, *for visional*, read *visual*. Second column, same page, 10th line from the top, *for since*, read *hence*.

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MESSRS. HANCOCK AND PETTIT'S PATENT RAILWAY TRAIN CONTROULER.

Fig. 8.



Fig. 9.



Fig. 1.

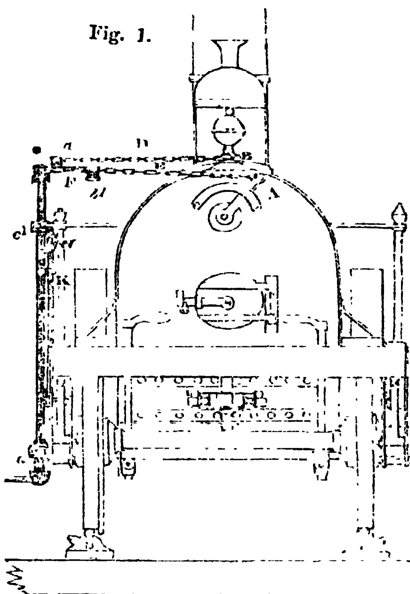


Fig. 1b.

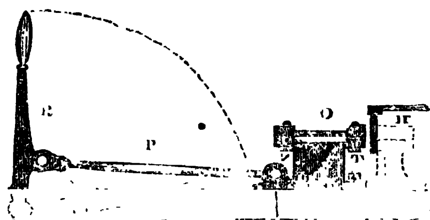
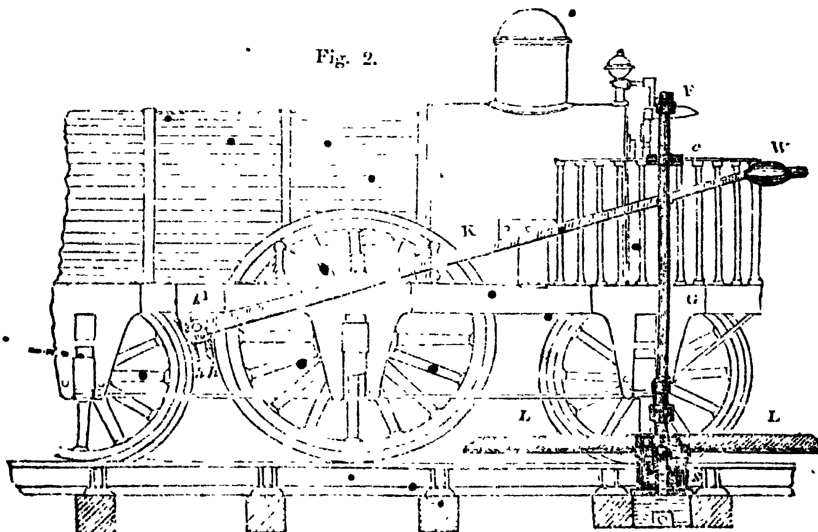


Fig. 2.



MESSRS. HANCOCK AND PETTIT'S PATENT RAILWAY TRAIN CONTROULER.

(From the *Railway Times.*)

We announced in our journal of the 26th of November last, that on the 19th of the same month we had been shown by Mr. Walter Hancock, the ingenious and persevering promoter of steam-travelling on common roads, a plan for the prevention of accidents on railways, which we thought better calculated to effect the desired object than any other which had then come under our notice. The distinguishing feature of this plan was stated to be that it provided for bringing railway trains to a stand under nearly all possible circumstances, "*independently of the engine-driver.*" "Drivers might be incompetent or careless, or suddenly bereft of power of action, but the safety of the passengers would be provided for nevertheless. Trains would always come into stations with the precise degree of velocity which they ought to do, and the arm of a single policeman have power to arrest the progress of the largest engine or longest train by which any railway could ever be traversed." The plan, though patented, not having been then specified, we were not at liberty to lay any further particulars of it before our readers; but this week the specification of it has been duly enrolled, and we have now the pleasure of extracting from it the following very clear and complete description*: —

The invention is described as consisting in "certain mechanical contrivances and arrangements, by means of which common railway trains running upon railways of the ordinary construction, may be always brought to a stand without the agency and independently of the will of the engine-driver, guard, or other person or persons thereon, or travelling therewith, and at any given distance from a station or at any part of a line where it may be deemed advisable to have such independent means of stoppage provided."

The "mechanical contrivances and arrangements" divide themselves into two branches, the first including those which relate to the engines and carriages, and the second those which relate to the roadway.

I. The additions proposed to be made to locomotive engines for carrying this plan into effect are represented in the accompanying engravings, figs. 1, 2, and 3.

"Fig. 1 is an end elevation of a locomotive engine, and fig. 2 is a partial side view thereof. A is the handle of the steam regulator, and B is the handle of the steam whistle. These handles are each fitted with loose collars, but so as not to interfere with the common mode of using them by hand; each collar has a projection to which the ends of the chains D and E are attached respectively, F is a horizontal lever fixed upon the spindle G, carrying the pins *a* and *b*, and to the two loose collars on these, the other ends of the chains are connected in like manner. The vertical spindle G is secured near the top by the bearing *c* fixed on the projecting rail; from this it descends through the eye *d*, attached to the guide plate of the axle on which it is supported by a collar, and H is a crank lever fixed on the lower extremity.

"When the engine is running, and the whistle shut, the several parts described are in the exact position shown in the drawing, viz. both the chains D and E strained tight, and the crank lever H standing out at a right angle to the side of the engine.

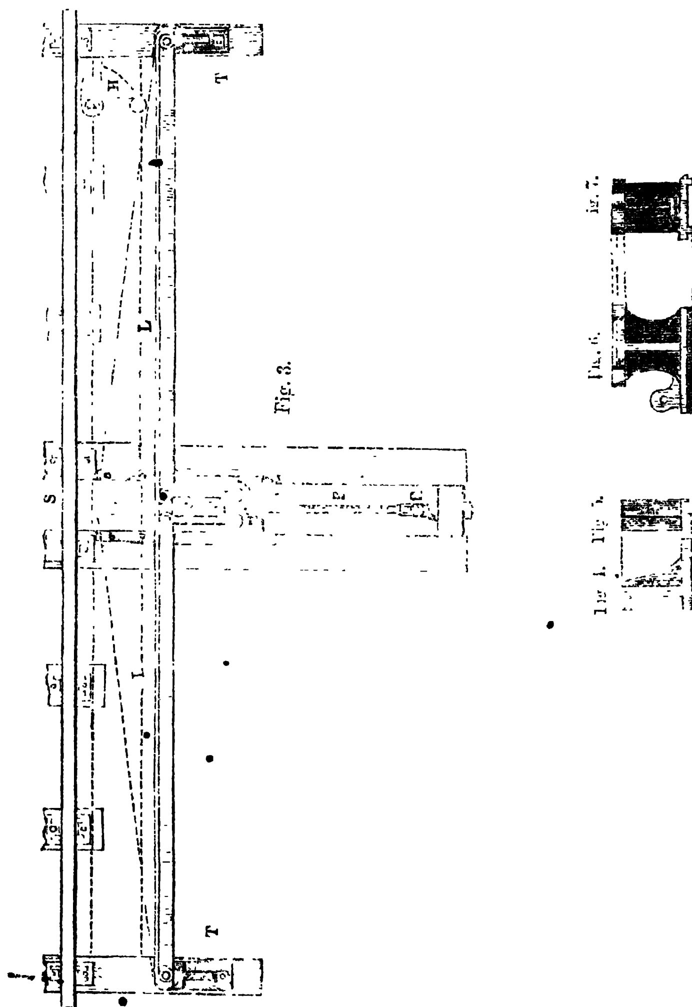
"Now, it is obvious that by fixing any apparatus on the roadway outside of the rails, by means of which the lever H may be pressed against, as the engine passes, to the extent of turning it about one quarter of a revolution, which will cause the two chains D and E to move with it, the steam will be shut off from both the cylinders, and simultaneously turned through the whistle.

"It may be proper, however, here to point out, that although the steam regulator, and whistle handles A and B, are connected to the lever F by chains, yet those handles can be worked by hand independently, either for the purpose of shutting off or putting on the steam to the engines, or blowing the whistle in the usual manner, leaving the crank lever standing in the position of fig. 1.

"Rods sliding in tubes on the principle of the telescope, admitting of the requisite contraction and expansion of the intervening distance, may sometimes be found convenient substitutes, for the chain D and E or any other suitable contrivance may be employed. A vertical instead of a horizontal action may be given to the lever by fixing it on a short horizontal axis, connected to the top of the spindle G by a small pair of mitre wheels, and supporting it by bearings fixed upon the most convenient part of the engine or carriage, or by any other mechanical means as circumstances may require."

* The patent is in the name of Mr. Pettit, but Mr. Hancock and Mr. Pettit are joint proprietors of the patent right.

II. The apparatus proposed to be affixed to the roadway to act on the combination of levers which has been just described, is also represented in figs. 1, 2, and 3, and in further detail in figs. 4, 5, 6, 7. " There are four sleepers of sufficient length to extend from under the line of rails to receive the apparatus fixed upon them in the manner shown in the fig. 3. Upon the two outside ones are bolted the blocks T T, of which figs. 4 and 5, represent an end and side elevation. The two middle sleepers are connected together about a foot asunder by the cross piece X, and they form beds fortified with



plates for the carriage N to slide upon; fig. 6 and 7, represent an end and side elevation of this carriage, showing two ribs cast upon the bottom tod top between the beds for the purpose of keeping the carriage in a proper position, during its backward and forward travelling motion. L L, are two pieces of strong angle iron, though any suitable material and form may be employed which move on centre pins, fixed in the top of the

blocks T T, while their other ends rest upon the end of the sliding carriage N, to which they are coupled by links O O moving on centre pins fixed in the back end of the carriage N. One end of the rod P is received by the jaws cast on the carriage N, in which it moves freely upon a pin, and the other end is forked, and forms a moveable joint with a piece or tongue projecting from the edge of the lever R (see fig. 1[b]), and the fulcrum of that lever is fixed to the cross timber morticed into the sleepers fig. 3. By joining the connecting rod P to a piece projecting from the edge of the lever R, the lever and rod, when the lever is put down will form a line occupying the position marked by the dotted lines in fig. 6.

"In the position in which the apparatus is shown in fig. 3, the pieces L L, or the slants as they may be termed, are parallel to the rails S; and, of course, stand clear of the crank lever H, which is carried by the engine (see fig. 1), but when it is necessary to act upon the lever H, in order to stop the train, the lever R must be depressed, which operating on the sliding carriage N, through the intervention of the rod P, advances or thrusts it forward together with the centre ends of the slants L L, towards the rails S to the extent of the dotted lines (see fig. 3.), which are then in the position to act upon the crank lever H, when brought into contact by the advance of the engine.

"The break lever K, fig. 1 and 2, moves inside of, and is suspended when out of action on, a projecting stud, inserted in the vertical spindle G. W is a weight to increase its power, or a spring to press upon the lever may be employed for the same purpose; this lever is fixed upon a short spindle passing horizontally through, and having its bearings in two plates, K, bolted to the engine frame, one within and the other without; of these, the outside one only, *k*, is visible in fig. 2, and upon the inside end of the spindle is fixed a short cross lever, the position and form of which is shown by figs. 8 and 9. The ends of this lever, K, bear upon the breaks *h h*., when the lever K is down, but each end has two cross pins under the straps *l l*, secured and screwed on the breaks for lifting them off the wheels on raising the lever K. These breaks are brought into action by lowering the lever K, occasioned by the removal of the supporting stud on the vertical spindle G, which is effected when that spindle is turned by the crank lever H, coming into contact with the slants L L in the manner before described."

The machinery last described is stated to be as applicable to the breaks, attached to the different carriages in a train, as to the locomotive engine; "especially upon such breaks by means of a spindle similar to the vertical spindle G, in the manner before described."

The lever R that brings the stationary apparatus into use may be worked by hand by any of the policemen stationed on the line, or other person appointed for the purpose.

The claim of the patentee is as follows:—"I declare that though I have specified under this head those contrivances and arrangements by which I think the objects in view may be best accomplished, and mentioned also certain contrivances which may be substituted for some of those so preferred by me, I declare that I do not confine myself to the precise arrangement and construction of the parts shown, as they may be varied under different circumstances without departing from the nature of my invention, but I claim a right to all variations and modifications of the same, and to all substitutions of equivalent means, either in whole or in part, by which the like effects may in the same general way be produced. And I declare, that what I claim generally is the addition to railway engines and carriages of such a combination or system of levers connected with the steam cylinders, alarums, and breaks, that being acted on in the direction of the line of motion, they shall simultaneously, or nearly so, shut off the steam, sound the alarums, and bring the breaks down on the wheels, and also the fixing to or placing on railways of an apparatus such as that before described in such a position that it can be made to act on the said levers in the direction of the line of motion, (by some projected part or parts thereof) without the agency, and independently of, the will of the engine-driver, guard, or other person or persons on the engine or train required to be stopped. And I claim both of the mechanical means, or system of means, last herein generally claimed, whether used together or used separately, that is to say, whether both are used together as I have described, or one of them only in combination with some other and wholly different means, or system of means, from that which I have specified."

LIFE AND LABOURS OF TELFORD. NO. VII.

(Continued from vol. xxxiii, page 10.)

The Menai and Conway Suspension Bridges.

Although it may admit of question whether the suspension bridge over the Straits of Menai were the master-work of the mind of Telford, there can be no doubt that it is that with which his name

is most intimately and most widely connected; and but little that it is upon this bold and successful specimen of the powers he possessed that his reputation will most likely descend unimpaired to posterity. It is indeed—not even excepting perhaps, the Pont-y-Cyssyllte—the most imposing of his works for the sublimity of its situation, the "poetry" of its conception, and the magnificent picturesqueness of its general appearance. These qualities so seldom combined in a production of engineering art, make it the "observed of all observers," and attract to it numbers without number of visitors, not only from every part of Britain, but from every corner both of the old and new continent. All who have visited England have seen, and all who have seen have admired it. From Puckler Muskau and N. P. Willis to Louis Philippe and Marshal Soult, all beholders have joined in paying their tribute of homage to the genius of THOMAS TELFORD.

The design of this splendid erection was, it appears, originally, made for a bridge in a very different situation in 1811, Telford had expended much time and trouble in projecting an iron suspension bridge over the river Mersey at Runcorn, and had even instituted a variety of experiments on the strength of iron, with a view to that work, and had constructed a model of it on a small scale. This idea, however, was never carried into effect; but when, in 1818, Telford was applied to on the subject of the passage of the Menai, he reverted to his design of four years before, and applied it to the widely different circumstances of the case before him. This was not the first time that the plan of forming a roadway across the Strait had been broached; so far back as 1801 Rennie had made the plans for two vast iron bridges for the same locality, and in 1811 Telford himself had made a report which included designs of bridges across both the Menai and the river Conway, which is on the same line of road. Nothing beyond this, however, had been done, and when, at the period referred to, the project was reviewed with greater vigour, the bold and intended plan of a suspension bridge—backed by the confidence which Telford's name and fame by this time inspired, was determined on. Although on the main line of traffic between England and Ireland, the Menai Strait up to this period was passable only in ferry-boats, greatly to the inconvenience and delay, and very often to the imminent danger, of the immense throng of travellers always passing and repassing. Notwithstanding this want of accommodation, a perpetual lease of this ferry having been granted by Queen Elizabeth, (at a rental of 3*l*. 6s. 8d. per annum,) Government were obliged to purchase the leasehold right, for no less a sum, by a verdict of a jury, than 26,954*l*., before they could enter upon a work so loudly called for, by public convenience, as a roadway across the Strait.

The site fixed on was at a spot called Ynys-y-Moch, where the breadth of the channel, when the tide is in, is three hundred and six yards, reduced at low water to one hundred and sixty. The main pier on the Anglesea side, which is placed on the Ynys-y-Moch rocks, is above the line of high water, but on the opposite or Carnavon side it is six feet below it. The height of the piers, from high water to the roadway, is just one hundred feet, and thence to the apex of each pier fifty-three feet. There are two parallel carriage ways, each twelve feet wide, with a single line of footway between them, four feet in width. The whole is suspended on four lines of massy chains, the distance spanned from point to point being no less than *five hundred and seventy nine feet!*

The first stone of this stupendous structure was laid on the 1st of August, 1819, by no higher a personage than Mr. Provis, the director of the works under Telford. In 1821 and 1822, operations were vigorously prosecuted, from five to seven vessels, and from 300 to 400 men being generally employed, chiefly in the preliminary works of founding and raising the piers, in which so much progress was made, that by June, 1824, both suspension pyramids were completed, and perforated by carriage ways, 9 feet wide: the iron plates and saddles for the reception of the chains were also fixed, in such a manner as to yield pressure only in a perpendicular direction.

When the pyramids were ready, temporary timber framings were constructed between them and the points on the shore where the main chains were to

enter the tunnels or excavations prepared for their reception. On these framings a set of four main chains was laid, and being secured under the roadway, the other ends were carried to the tops of the east and west pyramids respectively. On the Anglesea side, the chains so remained, but on the Carnarvon side, they were not only carried along the framing to the pyramid top, but brought over and down its surface to the water level. The portion of chain which was to complete the line between the opposite shores was then laid upon a timber float, moored to the Carnarvon side.

To raise this first line of connexion, and fix it in its proper place was a work of the utmost interest and importance, and one which Telford determined to superintend in person. He accordingly, in the middle of April, 1824, left London for Bangor for that purpose, and resolved to attempt the operation on the 25th, when an immense crowd assembled to witness the unexampled spectacle. On the appointed day, an hour before high water, the raft was cast off, and floated into its required position between the piers, where, being moored, one end of the chain which lay upon it, was carried to that which hung down the face of the Carnarvon pier, while the other end was attached to ropes which were connected with powerful capstans placed on the Anglesea side. The workmen at the capstans then commenced moving at a rapid trot, and in an hour and a half the chain was raised high enough to enable the fastening of a portion of it to the end of the chain on the top of the Anglesea Pyramid. Telford himself then ascended, and on proclaiming the gratifying fact, was hailed with enthusiastic cheering from the workmen and the immense body of wondering spectators. Thus the main land of Wales and the Isle of Anglesea were for the first time united by the hand of science.

By the 9th of June, 1825, the last chain had been raised, and the temporary platform removed. All doubt and difficulty had now vanished—if they had not in fact from the time the first chain had been successfully stretched across the strait; that proudest moment, probably, of Telford's life. In August the construction of the road platform was commenced, and in September the whole of the trussed bearing-bars were suspended. The platform was composed of two thicknesses of fir plank, with a thickness of patent felt between, while in the carriage ways there was a third layer across the former, and another band of felt between. By the latter end of 1825 the oak railings on each side having been fitted, the whole magnificent erection was pronounced "complete."

The 30th of January, 1826, was fixed on for the day of opening. This was accordingly a gala day for the whole northern part of the principality, but, greatly to the disappointment of the public generally, the Commissioners, at the solicitation of Telford himself, declined to get up a procession on the occasion, so that almost the only official manifestation of the jubilee feeling so universally prevalent consisted in a plentiful dinner to the large number of workmen who had been engaged on the works. In spite of this, however, great quantities of people assembled on the spot, to gaze with wonder and admiration on the now finished miracle of human skill, and to hail with repeated cheers the modern Merlin who had thus brought the ancient prophecy* to pass without the aid of a league with the powers of darkness. Alas! for romance! the *London mail* was (ostensibly) the first vehicle to cross the new "highway in the air." This was followed by the Chester mail, and this again by an endless succession of carriages and pedestrians throughout the day. It is understood, however, that previously to this public opening, Telford himself and his friend Sir Henry Parnell had driven over the bridge in the carriage of the latter, and thus enjoyed the novel sensation of crossing the sea in a vehicle at a height of a hundred feet above the tideway!

It is needless to add that since that day innumerable passengers, including amongst them a very large proportion of the "celebrities" of the world, political, literary, and scientific, have followed their example, and that the Menai bridge, in spite of endless anticipations to the contrary, still "towers in its pride of

* They had a prophecy, made by Robin Ddu, a famous minstrel, to the effect that the Menai would one day be crossed by a bridge. This was universally looked on as impossible, without the aid of magic.

place" above the flood, and in spite of the fury of the winds and waves, to which its exposed situation renders it particularly obnoxious. The only damage it ever received was in the severe storm of January, 1830, but on that occasion the injury sustained, although exaggerated at first by public report, was quickly and easily rectified.

It may give some idea of the stupendousness of every thing connected with this bridge to state that the total weight of the iron-work only is no less than *four million*, one hundred and seventy-three thousand, two hundred and eighty-six pounds; or, two thousand, one hundred and eighty-six tons! There are 16 chains in the breadth of the bridge, each comprising nine hundred and thirty-five bars. Its length is one thousand, seven hundred and ten feet, or nearly one-third of a mile. To descend from large things to small (though small matters here would seem great elsewhere) each coat of paint it requires weighs upwards of *two tons and a half!* Yet with all this ponderousness, the structure is so justly balanced, and so wonderfully adapted to the scenery amidst which it is placed, that to the spectator it appears a model of elegant and almost fairy lightness. It stands forth, like so many others of the works of Telford, a triumphant proof of its constructor's exquisite taste, as well as consumate skill.

The Conway Bridge is another edifice of the same class, and of only inferior excellence. This also enables the traveller to dispense with a dangerous ferry, and facilitates the traffic between England and the sister country. The principle is the same as that of the Menai, but the dimensions are by no means so large, the distance from point to point being but 317 feet, the versed sine of the main chains 221 feet, the number of chains eight, the roadway only 15 feet above high water, with one line for carriages. Here again Telford took a happy advantage of the situation prescribed to him. The bridge crosses the Conway exactly opposite the fine old castle built there by Edward I. the roadway seeming to aim directly at the castle gates. In order to harmonize with this position, everything about the bridge is elaborately finished in the castellated style, perfectly in unison with the fine old building to which it conducts the passenger. The castle is fortunately on a most extensive scale, so that Telford has succeeded perfectly in his intention, and the Conway Bridge, instead of breaking through all the cherished associations connected with its site, as too many of our modern structures in similar situations unfortunately do, appears like a huge drawbridge leading to the feudal fortress, and so entirely in character with it, that it is easy for a stranger to imagine it part and parcel of the Castle itself. The view of the bridge, including the castle, the town, the wooded hills and rugged mountains in the background, with Great Orme's meadow one side, and the picturesque valley of Llaurwst on the other, offers such a landscape as is rarely equalled in any country, compounded as it is almost equally of the works of Nature and of Art, each in perfect harmony with each.

The poetical features of Telford's great works have not escaped the notice of kindred minds among those who, unlike him, could *only* "*build* the lofty rhyme,"—and this slight sketch of his generally-acknowledged master-piece cannot conclude better than in the well-known tribute of Southey to his fame:—

"TELFORD, who o'er the vale of Cambrian Dee,
Aloft in air, at giddy height upborne,
Carried his navigable road, and hung
High o'er Menai's strait, the bending bridge,—
Structure of more ambitious enterprise
Than minstrels, in the age of old romance,

THE MISSING "PRESIDENT."

Sir,—I hope I shall not be justly chargeable with converting a public calamity like that of the apprehended loss of the *President*, into a pretence for puffing a patent, if I state, for the information of the steam-ship world and the public, that just before her present voyage changes were made in her paddles, which may go far towards accounting for her absence.

The paddles she used up to the date of her present voyage were of the kind patented by Mr. Elijah Galloway. Like those of the *Great Western*, the four Halifax mail ships, the *Great Liverpool*, the *Oriental*, &c., they were of two boards, one before, the other behind, the arm. Simple as is this arrangement of the floats, in rough water it is found to

relieve the engines in a very important degree, by reducing the variations in speed occasioned by the varying immersion of the wheels; they assist in keeping up the efficiency of the engines, and as they offer less surface than that of a plain paddle to a rising or falling wave, they diminish the shocks and sudden strains, and consequently the liability to injury, to which steam-ship machinery is usually subject.

These paddles, I have said, were used on the *President* until just before she last left England. Failing in his attempts to obtain compensation for their use, Mr. Routledge, the present proprietor of the patent, felt himself compelled to take other steps, and accordingly obtained an injunction from the Court of Chancery against their further employment. The owners still refused a satisfactory settlement, and altered the floats to the common plan.

We have to remember that the engines of the *President* are smaller in proportion to her size than those of other ocean steamers; and if we suppose that her effective engine power, thus originally deficient, was still further reduced by the adoption of the common floats, we shall need little more to account for her being unable to face the storms she encountered soon after she left New York. The other transatlantic steamers still use the floats she has discarded, and make their passages as usual.

The paddles of the *British Queen* were also altered, but to a different plan. Originally the wheels were made for three floats; to receive the lower one, a step was placed in the angle formed by the arm and the outer ring; this is about 7 inches long on its horizontal branch (supposing we are examining that at the lowest point of the wheels); just above this, with its back to the arm, was the next board, the upper one being placed behind the arms, which is about 4 inches wide. Thus the boards were about 4 inches asunder, being also about 12, 10, and 9 inches wide respectively.

To evade the claim of Mr. Routledge, the middle board was placed *behind* the arm, and the upper one *before* it; the consequence is, that a space 11 inches wide is left between the two lower boards, through which readily passes the current of water, escaping past the edge of the lower board, which ought to impinge on the next. It was accordingly foretold that the *British Queen* would make a long passage, as has happened, and I venture to say will happen again on her return. The loss of her paddles is easily explained, and had they not been altered, would probably have been avoided. In the most usual circumstances, the paddles, when arranged on the patent plan, shelter each other in some measure from the impulse of a falling or rising wave, while in the plan adopted in the *British Queen* they are all exposed to it.

I sincerely wish, and think there is reason to hope, that the present harrowing suspense as to the fate of the *President* will not be terminated by intelligence of her destruction. I shall be very glad if, in accordance with the above statement, it should be found that her locomotive, and not her floating, capabilities are to blame.

I am, Sir, yours very respectfully,

J. Chapman.

22, Change Alley, 20th April, 1841.

MR. NOTON'S EXPERIMENT WITH MR. MC NAUGHT'S INDICATOR.

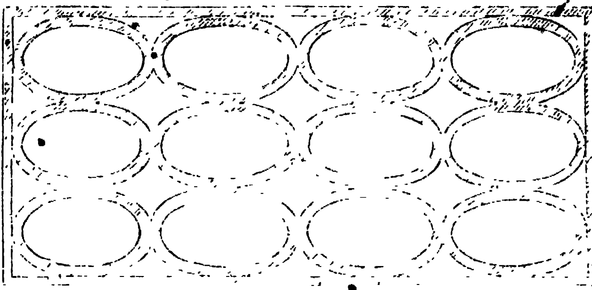
Sir,—Will Mr. Noton have the goodness to inform me, through your pages, what the *condenser* vacuum was, when he took the diagram given in the *Mechanics Magazine* of Saturday last? Or, for greater accuracy, as that is past, and probably not observed, will be so good as to take three or four more diagrams, and send the mean state of *exhaustion* only; (independent I mean of *steam pressure*) of each, with the exact average *condenser* vacuum *at the time*, and number of revolutions.

I am, Sir, yours respectfully,

James Pilbrow.

Tottenham Green, April 19, 1841.

IMPROVED PLUMBER'S GRATE.



Sir,—I have sent you a rough sketch of a plumber's grate front, which I have had in use in my workshop several years, and find it answer extremely well; not destroying near so many coals as the common straight bar grate. It is pretty well known that plumbers irons are continually in and out of the fire, pulling the coals out with them; this they cannot do so readily with the above oval shape fire grate front. The casting of the front is 18 in. by 11 inches, and ⅞ths of an inch thick; the sides and back are fire-bricks, which makes it come very cheap.

I remain, Sir, yours, &c.

J. Burgess.

Wisbeach, Feb. 9, 1841.

AN ANSWER TO MESSRS. J. DAVIES AND G. V. RYDER'S REPORT * ON PERKINS'S SYSTEM OF WARMING BUILDINGS BY HOT WATER. BY A. M. PERKINS, ESQ.

The excitement that has been occasioned by the destruction of Messrs. Craft and Stell's premises in Manchester, by fire arising from the bursting of the furnace coil of a hot water apparatus, on "Perkins's system of warming buildings by means of hot water," and the measures taken in consequence by the Manchester Assurance Company, have created an alarm as to the general safety of his plan, which the patentee feels it incumbent upon him to show is unfounded, and to prove that whenever an accident has occurred, it may in every case be traced, either to the improper construction of the apparatus in the first instance, or to carelessness and mismanagement in the use of it. It appears by a report which has been extensively circulated by the Manchester Assurance Company, that a Committee of the Directors of that Company was appointed "to inquire into the nature of the accidents which have recently occurred from the use of hot-water apparatuses, and to report thereon;" in pursuance of which resolution Mr. John Davies and Mr. George Vardon Ryder were directed "to institute a personal investigation into some of the cases referred to, and to make such experiments as might tend to satisfy their minds as to the causes of the accidents which had occurred."

In the report presented by these gentlemen to the Directors, they commence by describing "the appearances observed" at some of the places which they visited. These appearances consisted of "wood, matting, and cushions, in a variety of places contiguous to the hot-water pipes, having been charred to an alarming extent," and that Mr. Barbour's warehouse had "been on fire, *close to the pipes*, at different times and in different places." The Unitarian Chapel in Strangeways, also showed marked "appearances," the floor being charred black, and at the Natural History Museum in Peter Street, the matting on the floor had been charred, and the floor itself appears to have been scorched. The whole of these appearances were produced by one and the same cause—the overheating of the pipes; and this was doubtless occasioned by the disproportion of the furnace-grate and draught to the furnace-coil, like that erected upon Mr. Walker's own premises, for the purpose of Messrs. Davies and Ryder's experiments. Mr. Rawthorne's communication respecting the Strangeways Chapel affords sufficient evidence of an ill-proportioned and ill-constructed apparatus, the deficiency of heat, great consumption of fuel, offensive scent, and charred wood, are convincing proofs that the quantity of tubing laid down in the chapel was insufficient to afford a proper supply of warmth; and the endeavour to

* Vide page 294.

procure more heat by extra-firing sufficiently accounts for the great consumption of fuel, and the offensive scent given out by the pipes when thus overheated. In an apparatus justly proportioned, the water circulating in the pipes can receive but a given quantity of heat, and any fuel added beyond that point would not cause them to become overheated. It is necessary here to describe what "Perkins's system of warming" really is; for the patentee utterly disclaims the apparatus experimented upon by Messrs. Davies and Ryder as his, any further than that the pipes were closed in all parts.

Perkins's apparatus, then, consists of a continuous or endless tube, closed in all parts, a portion of which is coiled and placed within a *duly proportioned* furnace; from this coil the rest of the apparatus receives its heat by the circulation of the hot-water flowing from its upper part, and which, cooling in its progress through the building, returns into the lowest part of the coil to be re-heated. The expansion of the water, when heated, is fully provided for by the expansion tube, which is of three inches diameter, and of sufficient length to afford an expansion space of from fifteen to twenty per cent.: this, long practice has proved, is ample for the greatest heat which can be attained by the water, as it expands only five per cent. from 40°, its point of greatest density, to 212°, the boiling point. This tube is placed at the highest part of the apparatus, and is empty when the water is cold; the furnace is provided with a damper, by which the fire may be regulated at pleasure. In a well-managed apparatus this damper is in general nearly closed after the fire has become well ignited, and the draught is so regulated that little more than a slumbering fire is kept up, which at once economises fuel and prevents the possibility of the pipes being overheated. The degree to which the damper should be closed depends entirely upon the goodness of the draught; and a very few days'—even a few hours' experience will show the person in charge of the apparatus the point at which it is desirable to keep it. To most of the apparatuses recently erected by the patentee, a self-regulating damper has been attached, acting from the expansion and contraction of the pipe; when this becomes heated beyond any given point to which the damper has been previously regulated, the elongation of the pipe by the excess of heat acting upon the handle of the damper, partially closes it; the draught is thus checked and the fire lowered; the pipe consequently cools, and, in cooling, contracts; the contraction again opens the damper and the fire is revived. By this action of the self-regulating damper any degree of heat from the pipes may be maintained within a few degrees: if the damper be so fixed as to work the apparatus at 250°, it will be found that the heat of the pipes will range between 255° and 245°, whatever quantity of fuel may be thrown upon the fire; thus again the overheating of the pipes is effectually prevented, and an equal temperature at the same time obtained.

In the arrangement and fixing of any apparatus, regard ought always to be had (as has been already stated) to the due proportions of grate surface, heating surface, conducting and radiating surface, and draught; and where these have been duly observed, accident becomes impossible, even if the damper should be left wide open. It is not deemed necessary here to state the proportions the above surfaces should bear to each other, but their necessity is sufficiently obvious; an unlimited supply of heat arising from an excess of fire or heating surface and draught, with a limited means of carrying off that heat, must cause overheating somewhere, as is proved by the high temperature of the apparatuses at Birch Chapel, Mr. Barbour's Warehouse, the Strangeways Chapel, and the Natural History Museum; while, on the other hand, the due observance of these proportions render an apparatus upon this system perfectly safe. Nor can it be considered that, in claiming attention to the foregoing points in constructing an apparatus, the patentee demands too much; it is the duty of every tradesman who undertakes to erect these apparatuses to understand them; and to such an one what has been said presents no difficulties; and surely common care and the usual degree of prudence required from every person attending upon fires may reasonably be asked for in the mangement of a hot-water apparatus.

After this brief description of what a hot-water apparatus erected upon Perkins's system ought to be, it is necessary now to examine whether the apparatus erected in Mr. Walker's premises, and experimented upon by Messrs. Davies and Ryder, is to be considered as an apparatus upon Perkins's system, and what degree of weight ought to be attached to experiments conducted as they were, and upon such an apparatus. It appears from the Report of those gentlemen that it consisted of 140 feet of tubing, of which 26 feet were coiled in the furnace. With these proportions of tubing no fault is found; but it seems from the diagram annexed to the Report, that only 15 inches of expansion tube was attached to it (at least only that quantity was left unfilled with water), which, supposing it to be of three inches diameter, the largest size used, is six inches less than the apparatus required. This, in so small an apparatus, is a serious difference when worked at a very high temperature; still, however, under ordinary cir-

cumstances, the apparatus would have worked. The *damper* is not once mentioned in the Report, nor does it appear that it was ever made the slightest use of during the experiments, so that the full force of the draught was admitted to the furnace at all times unchecked, even when it was loaded with fuel to repletion. This might suit the purpose of those who erected this apparatus with the express view of making it as dangerous as air, fire, and water, recklessly employed, could make it; but what tradesman would introduce one so constructed into his employer's premises? But more could yet be done to increase the dangerous tendency of this apparatus; and, accordingly, in the absence of Mr. Walker, a stop-cock was introduced, which, cutting off the greater part of the circulation, left only *forty feet of the tubing* out of the furnace, to carry off all the heat that could be communicated from *twenty-six feet within it*, with a fire out of all proportion to those surfaces, and a draught totally unchecked. With the apparatus in this state—a state in which no man in his senses ever before thought of working one, and which, it may be safely asserted, had never before occurred since the introduction of warming by hot water—preparations were made for an explosion. The process of "igniting," "destroying," "fusing," "inflaming," and "charring" various substances, went on most prosperously, and, at length, the desired explosion took place; the fire was thrown violently out of the furnace, and the ignited embers were scattered in profusion over every part of the place. Some grey calicoes spread around the furnace were alone wanting to complete the scene, and put the finishing touch to this exquisite specimen of "Perkins's Hot Water Apparatus."

But can it be seriously intended that an apparatus thus erected, and thus worked, is to prove the *danger*, and caution the public against the use of Perkins's system of warming by means of hot water? Is the abuse of a thing to be used as an argument for discontinuing the use of it? To what invention will not such reasoning apply? Steam-engines, railways, all must vanish before it, since, if great skill and care are not employed in their construction, and much caution and prudence in their application, they become imminently dangerous.

Messrs. Croft and Steil's premises were burnt down; the fire was caused by the bursting of the furnace coil of the hot-water apparatus, which threw the ignited embers among combustible materials, and set them on fire. But was common precaution used in placing the furnace in such an apartment (the very walls of which were boards), and in surrounding it with grey goods? Would not a vault or a cellar have been a more appropriate place? and had the furnace been so situated, would the premises have been destroyed by the explosion which took place? This explosion was caused by a stoppage in the pipes; the water in them was frozen. It appears the warehouse was closed on Saturday evening, and not opened again before Monday morning; the frost being intense during the two intervening nights. A fire lighted in the furnace on Sunday morning was an obvious means of preventing such an occurrence; and it might have been supposed would have naturally suggested itself. Weather of such extreme severity is not very frequent in England, and the short time required for such a purpose (the necessity for it being evident) could scarcely be considered a desecration of the day. And even after the pipes were frozen up, common attention on the part of the fireman would have shown him the circumstance in a few minutes after the fire was lighted; the want of any circulation in the pipes being always indicated by their great heat near the furnace and their coldness in every other part. Had the fire then been raked out and the most exposed part of the pipes been thawed by the application of heat to them externally, the circulation might have been restored, and all would have been well. No precautions, however, of any kind appear to have been taken, and the endeavour to force a circulation in the state the pipes were then in, produced the disastrous event that ensued. It is not the object of the patentee to throw blame upon others, he only wishes to show that his apparatus may be used with perfect safety, if the same care and attention be bestowed upon it, as is required by every other mode of warming.

There are some palpable errors in the report of Messrs. Davies and Ryder in their remarks upon the inequality of the heat given out by the pipes in the Natural History Museum, and the manner in which they attempt to account for it. They observe, that the heat in those pipes had been repeatedly stated to become the greatest at places remote from the furnace, and that the fact was confirmed by their own observations and subsequent experiments; and in another part of the Report they account for it by stating, that the minute bubbles of steam which rise rapidly to the upper part of the flow-pipe become there condensed into water again. From this acknowledged fact they deduce the inference that, "as condensed steam wherever it occurs produces about seven times as much heat as the same quantity of water at the same temperature, we have at once a reason for the heat of the pipe being generally greater at a distance from the furnace than contiguous to it." This is a manifest absurdity, for it is impossible that increase of heat can be produced

by the condensation or cooling of steam. There cannot, therefore, be the slightest doubt that the statement of those gentlemen, that the heat is generally greater at points distant from the furnace than contiguous to it, is founded altogether in misconception and error. Another observation from which erroneous conclusions are drawn is, that the temperature of the pipes is influenced by the variation of their internal diameter, this is not the case; the amount of heat conducted off depends upon the surface exposed to the atmosphere, and not upon the internal diameter. Equal surfaces exposed to the atmosphere give off equal heat, whatever variation there may be in the velocity of the current of the water within the tubes.

The objection No. 1, relative to the possibility of an explosion from the inadequacy of the expansion tube, has been already met in the description of the apparatus in the former part of this paper; and overfilling the apparatus is impossible while the filling-pipe is made the only medium of supplying it, and the screw-plug of the expansion tube is at the time of filling taken off.

In objection No. 2, it is inferred that, because a pint of water may be converted into steam capable of exerting a powerful mechanical force, and present a pressure upon the tubes "sufficient to ensure their destruction," that such must inevitably be the case. Ten years' experience has, however, proved the contrary; any quantity of steam which can be formed in an apparatus properly put up, the tubes are perfectly able to resist.

Objection No. 3 supposes the presence of hydrogen gas in the apparatus to be a common occurrence, instead of a very rare one; and where it has occurred it has invariably arisen either from a faulty construction of the apparatus, or great neglect in its management. Admitting, however, that hydrogen gas has been formed within the pipes, no explosion can be produced by its expansion, as its expansive power is far less than that of water; neither can it explode within the pipes by ignition, as it requires an admixture of atmospheric air to render it explosive.

The remaining objection urged against the use of the apparatus is, the danger of explosion from stoppage in the pipes. This is a very unusual occurrence, and rarely happens except in seasons of very severe frost, when it may always be prevented by keeping a slumbering fire. The addition of three per cent. of salt to the water will also prevent it from freezing, even during such severe weather as was experienced last winter. The objection of stoppages by extraneous substances getting into the pipes, is scarcely worth notice; the last operation of the workmen in erecting a new apparatus is always to scour the pipes well through by means of a forcing pump, and then to close them up. How then can any substances get into pipes thus closed in every part, except by design?

It seems that previously to putting up the apparatus at Mr. Walker's, those at the Natural History Museum, and Messrs. Vernon and Company's, had been tried and found "unsatisfactory;" that is to say, they could not be sufficiently overheated. The patentee can show Messrs. Davies and Ryder some hundreds of apparatuses that would prove still more "*unsatisfactory*" to them than those just named. Since the foregoing remarks were written, Mr. Perkins has received a letter from Sir Robert Smirke, in which that gentleman says, "I am sorry to know that you think the partial use of my answers to the questions sent to me from Manchester (as printed in the Report there) has been in any degree prejudicial. If it has been so, I think you ought in the reply you are about to publish, to counteract that effect, especially as it was one not at all intended. They should, at least, have directed equal attention to my remark that complete security, under every contingency, might be obtained from the adoption of your safety-valves."

Comment upon this is unnecessary; it only strengthens the feeling which the perusal of Messrs. Davies and Ryder's Report has very generally produced, viz. that it is very unjust, and that the absurd experiments detailed in it were conducted with any view rather than that of candid investigation.

If those who possess the means of obtaining the information would make known the causes of all the fires that have come under their cognizance within the last eight or ten years, as far as they can be ascertained, the patentee is confident that such a statement would speak more in favour of his apparatus than the most laboured arguments. There are not wanting, however, many persons even in Manchester itself, who, placing more confidence in their own knowledge of the apparatus, founded on several years' experience, than in the Report, have unhesitatingly expressed their determination to continue the use of it as heretofore.

The safety-valves, alluded to by Sir Robert Smirke, have been but recently applied; and effectually provide for any casualty which can arise from a stoppage in the pipes.

In conclusion, the patentee begs that the Directors of Assurance Companies, and the public generally, will not hastily form their opinion of Perkins's hot-water apparatus from the very erroneous reports which have been circulated respecting it, as it is his intention to request a committee of competent gentlemen connected with insurance offices to inspect an *apparatus properly constructed*, and which he *wishes* to have subjected to any test to which such committee may think proper to submit it.

6, Francis-street, Regent Square, April 10, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.

THOMAS SPENCER, OF LIVERPOOL, CARVER AND GILDER, AND JOHN WILSON, OF LIVERPOOL, LECTURER ON CHEMISTRY, *for certain improvements in the process of engraving on metals by means of voltaic electricity.* Petty Bag Office, April 7, 1841.

When a copper plate is to be engraved, it is first coated with an etching ground, or other protecting substance, through which the drawing, &c. is to be made with a fine pointed instrument; taking care that the metal is completely exposed wherever the lines are required. The plate thus prepared is connected with the negative pole of a galvanic battery, and placed in a vessel containing a solution of sulphate of copper. A second plate of copper, connected with the positive end of the battery, is then placed in the same vessel with the plate that is to be engraved.

The electric circuit being thus completed, it will begin to bite out the metal from those parts of the first plate which have been exposed by removing the etching ground; the extent of this action being regulated by the distance of the two plates from each other, by the quantity and intensity of the electric current, and the time allowed for its action. When a cylinder is to be engraved in this manner, it is to be prepared in the same manner as the plate, and placed within a cylinder of copper in the solution.

To engrave on steel it is placed in a solution of common salt, or some other alkaline, earthy, or metallic salt, and is opposed by a steel plate in lieu of copper. When silver is to be engraved, a solution of sulphate of soda, or sulphate of silver is employed, and a silver plate in opposition. In the case of gold, the solution should be a solution of hydro-chloric acid, or a soluble chloride, with an opposing surface of gold.

Other metals can be engraved by this process in like manner.

The claim is, to the use or application of voltaic electricity for the purpose of engraving metallic surfaces generally.

JOHN DAVIS, OF MANCHESTER, CIVIL ENGINEER, *for certain improvements in machinery or apparatus for weaving. A communication.* Petty Bag Office, April 7, 1841.

A self-acting temple is thus constructed: to the breast beam of the loom two "fixtures" are attached, each having a slot within which a screw traverses: at the inner end of this screw there is a metal projection to which a slide plate of sheet-iron is attached by two adjusting bolts, so that it may be set to any required angle. The edges of this slide plate are bent, in order to hold the wheel and wheel-plate; the wheel is pierced all round for the insertion of teeth, which are secured in their respective places by pressing the flanges of the wheel in a die. The cloth passes first over a projection on the wheel plate then round the wheel, and out at an opening through the wheel-plate to the cloth beam. The temples can be set closer together or wider apart, according to the width of the cloth, by means of the screws above mentioned. Another modification of the temple is shown in which there is a slight difference in the wheel-plate.

In the case of segment temples, they are connected to the breast beam by springs, their distances being regulated by expansion screws. This temple is composed of a plate containing two rollers, over which a toothed segment travels; one of the rollers turns on a stud, but the other is fastened on its axis, which reaches from one temple to the other, having on its centre a small carded roller in contact with the cloth, so that as the cloth proceeds towards the cloth beam it turns the roller. The selvages of the cloth are taken hold of by the toothed segment, which travel in a curved path in order to stretch the same.

In order to obtain a "taking up" motion, the upper end of a lever presses against the back of the reed; this lever is centred upon a stud that projects from the lathe-sword, and is kept in contact with the reed by a spring; the lower end of the lever is occasionally brought in contact with a stud upon a horizontal shaft at the bottom of the loom which is capable of vibrating to and fro in suitable bearings. One end of this shaft is provided with a spring latch, which takes into the teeth of a ratchet wheel on the foot of a vertical shaft, having at top an endless screw driving a wheel at the end of the cloth beam; at the opposite end of the horizontal shaft is a stud, acted upon by an elbow lever worked by a cam.

When the reed has struck the weft it falls back upon its hinges, and causes the lever to move the horizontal shaft towards the ratchet wheel, by which means the spring latch falls into a tooth in advance of the ratchet wheel; the cam then causes the elbow lever to move the horizontal shaft back, in the reverse direction by means of the stud, by which means the vertical shaft is turned partly round, and by means of its worm the cloth-beam is also turned and takes up a portion of the cloth.

The claim is, 1. To the herein described arrangement and combination of mechanism or apparatus, consisting of a self-acting temple, as applied to looms for the purpose of

retaining fabrics at a uniform width during the process of weaving.

2. To the application of a toothed wheel, in the position sustained and adjusted as herein described, together with the projecting pieces on the wheel-plate, over which the selvage of the cloth is turned, so as to enable the teeth or points to lay hold of the selvage of the cloth; and further the mode of adjusting obliquely or angling the temple by means of the adjusting bolts, and the mode of securing the wheel-plate in its position in the slide-plate of sheet iron, together with the manner of securing the pins or points in the wheel by subjecting the flange of the wheel to pressure.

3. To the combination or arrangement of the segment temple, with the small roller covered with card teeth.

4. To the arrangement of machinery herein described, and the adaptation of a spring reed, by which the patentee is enabled to obtain a "taking up" motion as applied to weaving machinery.

JAMES FILT, SEN., OF WILMER GARDENS, HOXTON OLD TOWN, MANUFACTURER, *for a novel construction of machinery for communicating mechanical power.* Petty Bag Office, April 7, 1841.

The first part of this invention consists of an apparatus for communicating power. The power is applied to the ends of two main levers, one at each end of the machine: the other ends of the levers are supported on suitable axes from each of which a pendulum is suspended. To each of these axes a sector is attached, having a chain at each end, which, after passing over two pulleys, placed above and below the axes of the main levers, are fastened to a second or auxiliary lever. There are two of these auxiliary levers, which are attached by their other ends by connecting rods to two cranks, which communicate motion to the main-shaft by toothed gearing; or a plain shaft and two eccentrics may be used, in lieu of the crank-shaft. A similar arrangement, but actuated by only one main lever, is described, and is termed a single machine.

The second part of the invention consists in a mode of communicating a reciprocating action to the main lever from a rotary one. To the centre of the main lever, one end of a bar is fastened by means of a pivot, the other end works to and fro in a slot in the power end of the main lever, and is attached by means of a chain to a second bar to which a rotary motion is given; the revolution of this bar alternately raises and depresses the power end of the main lever, producing the required motion.

The claim is, 1. To the general arrangement of the several machines described.

2. To the combination of a lever and pendulum, or levers and pendulums, vibrating upon one and the same fulcrum, centre, or axis, combining thereby the power of gravity and motion, and the mechanical action of the lever giving out the power communicated to the levers and pendulums, by means of the sector or sectors, or any modification thereof; thence by means of the compound or auxiliary lever or levers to a crank-shaft; or its substitute, where rotary motion is required; or from the auxiliary levers direct to the machine or apparatus, where reciprocating action is wanted.

3. To the arrangement for the purpose of communicating a reciprocating from a rotary motion.

CHARLES PAYNE, OF SOUTH LAMBETH, SURREY, GENTLEMAN, *for improvements in salting animal matters.* Enrolment Office, April 12, 1841.

The mode of salting propounded by this patentee is as follows:—

The meat to be salted is placed within a strong iron vessel, which is closed in an air-tight manner, and the air exhausted from it by means of an air-pump; a communication is then opened with a brine vessel, whence the brine flows into the receiver, until it is about half filled; the air-pump is then again worked to draw off every particle of air from the meat, &c. The brine is then permitted to fill the receiver, and a farther quantity is injected by means of a common forcing-pump, the pressure being regulated by a safety-valve loaded with about 100 or 150 lbs. upon the square inch. After remaining under this pressure for about fifteen minutes, the meat is effectually cured, and may be taken out of the receiver.

The claim is to the mode of salting animal matters (preserved or cured by salt) by causing the liquor used to penetrate into such animal matter by pressure, or pressure and vacuum, when such matters are contained in a suitable close vessel.

This process seems to be simple and efficacious; it is certainly a very expeditious one.

HENRY PINKUS, OF 36, MADDOX-STREET, REGENT-STREET, ESQUIRE, *for an improved method of combining and applying materials applicable to the formation or construction of roads or ways.*—Rolls' Chapel Office, April 15, 1841.

This improved method consists, in the first place, in the method of combining materials so as to form foundations as bases for superstructures of roads, ways, streets, or railways, and applying to said combinations fixtures so as to suit said combinations or structures to the impelling of common or improved vehicles thereon. In order to form the paved ways of streets for the use of superstructures of wood, stone, or other materials, a foundation is formed of rough close-set rubble stones, with their broad

faces down, and their pointed ends up. These stones may be from 5 to 8 inches broad on their lower faces, and from 7 to 12 inches high in the middle part of the road, gradually diminishing in size towards the sides. The interstices between the upper part of the stones are to be filled up compactly with broken stones, so as to form a compact mass; the surface should be rammed or rolled, and grouted. In beds of foundation so formed, or on beds of broken stones, "Buttress-sleepers" are laid in parallel lines all along the road, which constitutes the abutments of arches of short span, by which the road is divided transversely. Transoms or ties may be placed at convenient distances to maintain parallelism of the "Buttress-sleepers" when necessary, or they may be laid on piles; or, in lieu of the rough rubble foundation, a foundation of broken stones is formed, about 4 or 5 inches in depth, applying thereto the "Buttress-sleepers" as before; or, in lieu of broken stones, a foundation of rough bricks is formed into squares, which form arches of slight curvature resting against the "Buttress-sleepers," the arches having brick abutments laid longitudinally so as to form interstices about 2 feet square, which may be filled in with earth, well rammed, or broken stones or gravel, and form a level surface with the arches. With foundations so formed, a superstructure is laid of wood or stone blocks (if wood, with the cross section of the grain set horizontally), either cubical or rhomboidal; the blocks may be 6 inches by 6 inches, 6 inches by 9 inches, or any other dimensions. These are formed into textile or woven masses in the following manner:—In one or more sides of the blocks, near the middle, there are formed angular or circular grooves; into these grooves long metal rods are inserted, about 1¼ inches in diameter, and from 6 to 9 feet in length. The rods and grooves are to be so arranged that one series of rods shall be parallel with, and the other series at right angles to the line of road, or the blocks and rods may be laid diagonally throughout.

In order to prevent the slipping of horses, a circular indent is cut on the top of each block, about 5 inches broad and 1 inch deep, which indents are to be filled with composition, such as any of the asphaltums mixed with gravel, &c., or what is called artificial granite; or hard burnt tiles are inserted into these cavities. When the structures hereinbefore described are applied to turnpike roads, tram or wheel ways may be formed; the centre track may be about 3 feet wide, and the outside tracks about 2 feet each. Metal tram ways, having a slightly concave surface, may be laid on the tracks, and let in flush with the surface level.

So far, well; but the patentee then proceeds to describe matters which, however useful or ingenious, are evidently altogether an afterthought, and are not included in the title of, nor protected by the letters patent.

In order to facilitate the impelling of carriages or trains over ascending planes, the patentee states that he combines with an inclined plane on a road or railway, a fixed centre rail, whose vertical section is a frustrum of a cone; at the foot of the incline this rail is tapered to a thin section, and increases gradually for 100 feet. To the locomotive engine an adhesion apparatus is applied, and put in motion by the impelling power in the following manner:—On the crank axle of the locomotive, two bevil wheels are fixed, working into two pinions fixed in a crutch on the frame work of the locomotive. On the axle of the pinions there are two adhesive wheels, put in motion by the bevel wheels on the crank axle working in the pinion. These must be so proportioned that the periphery of the adhesion wheels must move through the same space as the driving wheels of the locomotive. The adhesion wheels are caused to press against the centre rail with sufficient force, by means of a suitable arrangement of levers, &c., and may be thrown in and out of gear at pleasure. The adhesion of the wheels on the centre rail will materially assist the bite or adhesion of the driving wheels, and enable the engine to overcome the gravity of the load on inclined planes. This improved impelling apparatus is to be applied to any kind of locomotive, whether of steam—gaso-pneumatic—or electro-magnetic.

And further the better to regulate the working of roads or ways, the patentee proposes to employ self-acting or self-regulating indicators, for marking the time of arrivals and departures of carriages or trains at and from stations, by applying as fixtures or near stations, stamping or printing apparatus, and applying to locomotive engines or carriages and apparatus, index or indices which united with said indicators for the purpose of stamping or printing the time of arrival and departure, or passing of trains at stations; or the time of passing stations by quick trains, on the latter of which is recorded whilst passing said stations, the time of departure of the preceding train; which record is made visible to the engine-driver after he has passed the station.

Within about 300 feet on either side of a station, between the tracks of a line of rails, a convenient frame is placed, its upper part being a little above the surface level. On the side of the railway near the indicator is placed a clock; from the hour and minute spindles of the clock, pitch chains are car-

ried to the two circular revolving hour and minute spindles of the dials on the line of railway.

These pitch chains move over pullies on the spindles and hence the hour and minute spindles of the clock, put the revolving hour and minute dials of the indicator in motion. The dials form a part of and are placed in such a position, as that one of the slanting sides shall be parallel to the horizon. The moveable dials have a case and cover with a small opening on the upper or horizontal side; the cover to this opening is attached to a moveable axle, having a spiral spring wound round it, the action of which closes the dial. To the cover is attached a lever standing at an obtuse angle with the handle of the cover; to the extreme end of the lever is attached a rod having a hook or tooth upon its end, and which catches in the teeth of a ratchet wheel; on the axis of the ratchet wheel is affixed a cylinder. The moveable dials are made of some thin flexible substance, being numbered on both sides by raised figures, that is to say on the upper and under surface.

The letters and numbers in the course of their circuit pass under and over ink rollers and being raised take the ink like types. Upon a locomotive impeller, or other vehicle of a train, a circular wheel is supported in a vertical position by a flexible spring. On the periphery of this wheel is a band of felt or other soft substance, and on the outside of it is affixed a band of paper or other substance capable of taking an impression from the numbers on the hour and minute circles of the moveable dials. This wheel (called the register) is enclosed in a case having an opening in the front of it. Suppose a train approaches the station, the opener will come in contact with the cover on the exposed part of the moveable dials, and force it open; the register wheel coming directly after will roll over the letters on the exposed part of the dials and take an impression from the ink, or indentation when stamped, or both. As soon as the wheel has passed over the exposed part of the dials it loses contact and hence stops in its motion; the spiral spring returns back and covers up the exposed part of the dial. To the same locomotive impeller, near the seat of the conductor of the train, is attached a vertical wheel, similar to the one already described. This wheel (called the reporter) informs the conductor what time the former train passed. For this purpose, an endless band of paper or other substance is passed under the exposed part of the moveable dials, and at the moment the register wheels pass over the dials the raised figures on the under side of them will be pressed down upon the paper band, and leave the same impression upon it as was left upon the register wheel.

Suppose a train approaches the station, an opening in front of the reporter will remove the cover, and the reporter rolling over it will take an impression from the paper band. The conductor without stopping at the station may see the time the former train passed that station, by turning the reporter round. The same action taking place after this train has passed, will leave the time exposed to the next train that may pass, which will in like manner receive an impression.

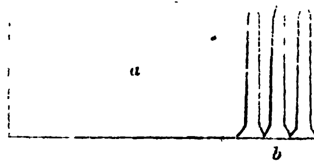


RECENT AMERICAN PATENT.

[From Dr. Jones's List in the Journal of the Franklin Institute, for January, 1841.]

FOR AN IMPROVEMENT IN CUT NAILS AND BRADS, AND IN THE MACHINERY FOR MANUFACTURING THE SAME; *Walter Hunt, city of New York, November* 12.

"The improvement in the form of said nails, brads, &c. consists in their being cut from hoops or plates of iron, with blunt, wedge-shaped points, and dove-tail or wedge-shaped heads," as shown in the engraving,



where *a* is a nail plate, and *b b* the nails. It will be seen that these nails do not require heading, they being cut with a projection on each side, forming what may be called a double brad head.

The cutting is effected by cutters, which are segments of cylinders made to vibrate on their axis; and so far as we can judge from the model, and from the nails and brads cut by the machine, its operation appears to be perfect, whilst its construction and arrangement are such as to promise durability.

The claim is to "the making the two sides of the head of one nail out of the metal left by cutting the wedge-shaped points of the nails on each side as herein above described; and this I claim whether effected by the above described machine, or any other. Also, in the machine above described, I claim the shifting of the bed cutters for the purpose and in the manner set forth."

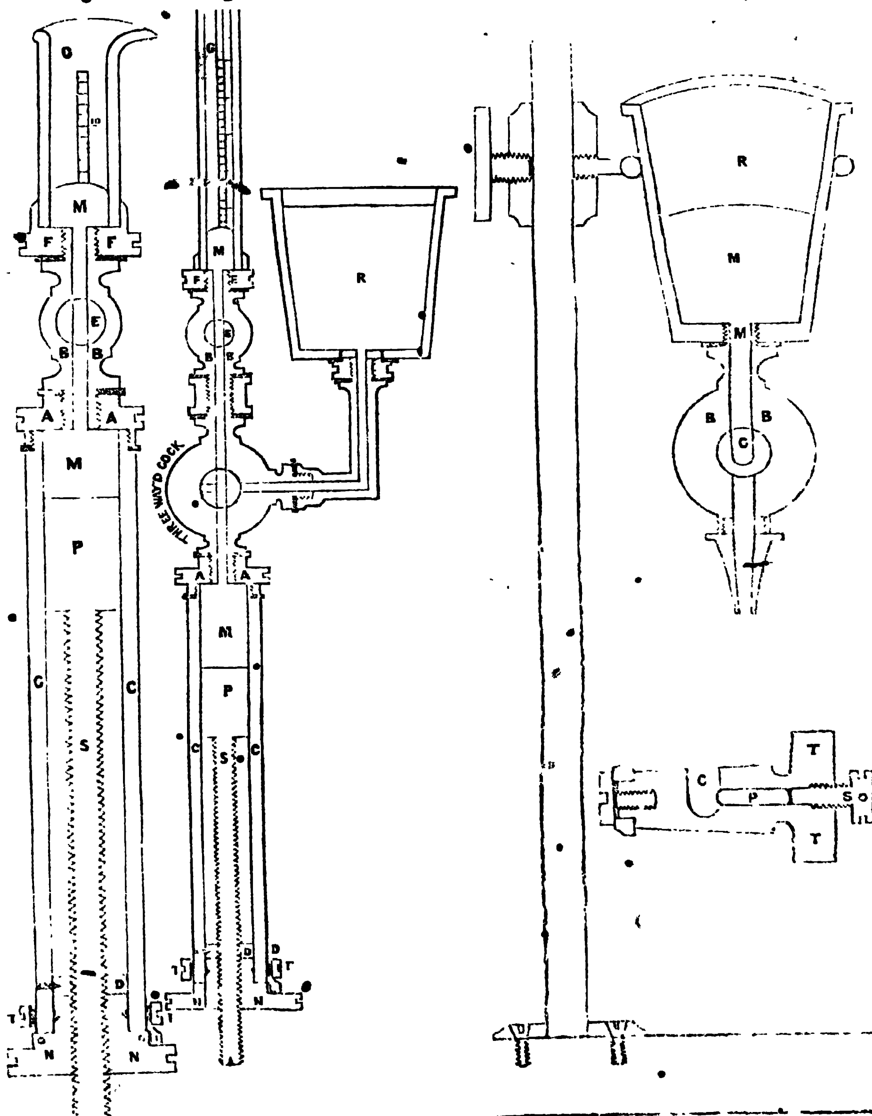
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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 925.] SATURDAY, MAY 1, 1841. [Price 3d.

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MR. COATHUPE'S GRADUATING INSTRUMENTS.



A DESCRIPTIVE ACCOUNT OF SOME NEW INSTRUMENTS FOR CORRECTLY GRADUATING GLASS TUBES FOR EUDIOMETRICAL AND OTHER PURPOSES.

[In bringing before our readers the following interesting particulars of some highly ingenious instruments invented by our esteemed correspondent, Charles Thornton Coathupe, Esq., we have to apologize for the length of time that has elapsed since the Treatise* from which they are taken, was placed at our disposal. It was accidentally mislaid after perusal, and for a long time eluded the most diligent search after it. Ed. M. M.]

The first is an instrument which was described to the Chemical Section of the British Association, at Birmingham, in September, 1839. It is for the purpose of accurately graduating glass tubes for Eudiometrical researches, with great facility.

It consists of a truly-bored cylindrical tube of iron C C, fig. 1, into which an iron piston P, is accurately fitted. Upon the rod S of this piston a screw is cut, with a good pair of dies, throughout its entire length. The rod is then filed of a triangular form, leaving sufficient of the threads of the screw at the rounded angles for an iron nut to traverse with security and freedom. To the upper extremity of this iron cylinder, a cap of the same metal is screwed A A, and into this cap is screwed an iron stop-cock B B. To the stop-cock is attached a glass measure G with a narrow lip, by means of an iron connecting socket F F. Near the opposite extremity of the cylinder, an iron diaphragm D, of about a quarter of an inch in thickness, is inserted, and is fastened in its place by a side screw, or pin; and through this diaphragm D a triangular hole is made, through which the piston rod S can slide easily up and down, but without lateral shake. Below the diaphragm, and at the extremity of the cylinder C C, the nut N N is inserted, whose action propels or retracts the piston P, without the possibility of the piston itself deviating from a right line. This nut N N enters the cylinder to the depth of about half an inch; and around the entering part a deep groove, in the form of the letter V, is turned, into which the pointed ends of three steel screws enter through the exterior of the cylinder at equal distances, in such a manner that the nut can be revolved freely, but cannot be otherwise displaced. From the entering part of the nut a projecting portion forms a [illegible] O O, which is graduated in equal parts; which projecting portion may be of any diameter greater than that of the cylinder. On the exterior of the cylinder an index I is fixed, by means of which any number of revolutions of the nut, or any number of equal parts of a revolution, can be ascertained.

To prepare this instrument for use, the piston is to be retracted to its lowest position, and the cylinder is to be filled with mercury (without air bubbles), by pouring a sufficient quantity of this metal into the glass G that is attached to the stop-cock B B, and turning the plug E for its admission within the cylinder C C.

If, when the cylinder is full, and while some mercury still remains within the glass measure G, we turn back the plug of the cock, we get the air-way of the plug E filled with mercury; and by pouring off the superfluity, we have the instrument in a proper state to commence graduating any tube for laboratory purposes. Thus, if the tube to be graduated be closed at one extremity, and has a diameter of about a third of an inch, if we open the communication between the cylinder and the glass measure, and propel the piston by one whole turn of the nut, and then close the communication between the cylinder and the measure, by turning the plug of the cock,—we have within the measure a definite quantity of mercury, which, when poured into the tube to be graduated, will give the space for the first division; and such similar spaces may be respectively marked with a diamond point, or with the angle of a fine three-cornered file,

* A Descriptive Account of some new instruments, for correctly graduating glass tubes for Eudiometrical and other purposes, and of some Eudiometric Apparatus recently invented, by Charles Thornton Coathupe, of Wraxall, near Bristol.
Bristol: Philp and Evans. London: Ball, Arnold, and Co., pp. 19, and 5 plates.

by repeating the process, until the whole tube be divided.*

But suppose the tube to be graduated has the means of admitting air through either extremity,—say an iron cap and stop-cock attached to its upper end,—and that we wish to graduate it from the plug of the stop-cock, *downwards*, so as to preserve the convex surface of the mercury, as it will invariably present itself when the tube is in subsequent use,—

First, cement an extemporaneous cap of box-wood to the lower extremity of the tube to be graduated, which cap must have its terminating orifice tapped to fit the screw of the stop-cock of the graduator.

Then, fill the tube itself with clean mercury (free from air bubbles), and screw it firmly, by means of the box-wood cap, to the stop-cock of the graduator.

The cylinder of the graduator should contain about an inch of mercury previous to its being secured in its upright position for use; and this point being ascertained, open the communication between the tube to be graduated and the graduator, and remove the plug from the upper stop-cock of the tube to be graduated. Now, propel the piston of the graduator upwards until a rounded semi-globule of mercury appears within the transverse cavity from which the plug has been removed. Replace the plug, to dislodge the superfluous mercury, and then turn it so that air may enter the tube as the mercury is withdrawn gradatim. Equal portions of mercury are to be withdrawn from within the tube by retracting the piston of the graduator any certain number of turns, or parts of a turn, by means of the graduated nut and the index fixed upon the exterior of the cylinder.

Now, it may so happen that the capacity of the tube to be graduated may exceed the capacity of the cylinder of the graduator, and consequently a difficulty might thus occur which may be obviated by the contrivance I am about to describe.

This contrivance consists of an iron reservoir connected by a right-angled iron tube to an iron stop-cock having three air-ways, which stop-cock must be interposed between the graduating cylinder and its own proper stop-cock already mentioned.

* The cylinder of the graduator which I use in my own laboratory is 7 inches long, and the diameter of its bore is three quarters of an inch. The length of the piston is $1\frac{3}{8}$ inches; and of the rod, 6 inches. The cylinder is formed from a portion of gun barrel.

Its application is very simple, and its use may be described as follows:—

Suppose the cylinder of the graduator to be full of mercury, and the tube to be graduated still containing mercury.

Turn the plug E, fig. 2, of the stop-cock B B to which the tube to be graduated has been affixed by the box-wood cap, so that no more mercury can escape through its orifice. Now turn the plug of the three-wayed cock in such a manner that there shall be a free communication between the cylinder of the graduator and the mercurial reservoir R. By gently propelling the piston upwards, we shall displace all the mercury from within the cylinder C C, and transfer it to the reservoir.

Turn back the plug of the three-wayed cock, so as to shut off the communication between the reservoir and the cylinder, and to open that between the cylinder and the lower stop-cock B B, to which the tube to be graduated is attached; then re-establish the free communication between the tube to be graduated and the three-wayed cock, and continue retracting the piston of the cylinder to the extent previously adopted for each division, and proceed to graduate the tube as before.

Fig. 3, is a contrivance for repeatedly obtaining with precision any definite proportional divisions of a cubic inch.

It consists of the mercurial reservoir R, detached from the figure, plate 2, into the bottom of which an iron cock is screwed.* The plug of this cock is not perforated all through, but has simply a cavity C in its side, at right angles to the thumb-piece, T T, which has been enlarged by means of a cherry bit until it would contain, when *in situ* and turned towards the reservoir, rather more than the quantity of mercury which it is intended to deliver when its position is reversed.

This cavity penetrates below the central axis of the plug. Through this central

* The reservoir for the mercury (in my own apparatus) is of cast iron, $2\frac{3}{4}$ inches in diameter, internally, and $2\frac{1}{4}$ inches deep. It is formed from the internal cup of a common glue-pot.

axis a hole is drilled from the thumb-piece until it communicates with the cavity. Into this hole a piece of steel P is fitted by grinding. That end of the steel pin which penetrates the cavity is rounded and polished. It is propelled forwards into the cavity by means of a capstan-headed screw S, as shown in the drawing, fig. 2.

The object of this steel pin is to displace the excess of mercury which the cavity C may contain over and above the quantity which it is intended to measure and deliver. If, for instance the cavity C is intended to measure and deliver 1-20th of a cubic inch, insert the plug, (fig. 2) in its proper place, with the orifice of the cavity C turned upwards (as shown in fig. 1), and having accurately weighed 171.26 grains of mercury, pour it through the upper orifice of the cock B B, and gently turn the plug until the sharp circular edge of its cavity C barely intersects the circular edge of the passage through the cock B B.

Now propel the screw S until the protruded steel pin has forced the mercury to rise within the cavity so as to exhibit a small bright speck at the point of intersection of the circumferences of the plug cavity and the passage of communication through the cock. The adjustment is thus accomplished; and 1-20th of a cubic inch of mercury may now be received from the mercurial reservoir R, and delivered from the plug as rapidly as may be required, by simply alternating the motion of the plug so as to present the cavity C, first upwards to receive the mercury from the cistern, and then downwards to deliver it, through the terminal orifice of the cock, into the tube to be graduated.*

PROPELLING — CAPTAIN CARPENTER IN REPLY TO MR. STEVENS.

Sir,—Disputed points of science, need not the test of "bets," to work out their elucidation. In number 923 of your Magazine, Mr. Stevens, reverting to the trials of speed and power between our working models deposited in the Polytechnic Institution, would fain establish such a "position." To it I cannot accede. In the course of the next week, I return to town, when I shall have no objection to institute with Mr. Stevens another series of comparative experiments, without a "wager." I shall feel happy to impart to Mr. Stevens, and to receive from him every information, with a view to the equalisation of "*vis motrix*" in both models. Thus, in a small scale we shall reach the truth, and determine the relative merits of his lateral paddle-wheels, and of my submarine "quarter" propellers.

The power I purpose to use is a spring, now with the makers, Messrs. Smith, Queen-street, Clerkenwell, which Mr. Stevens is at liberty to inspect. This gentleman's paddle-wheels must also be made to scale in due proportion to the vessel and according to the limits of practical use in ocean navigation. Equal proportions of weight or ballast must be borne by each model. It is unnecessary to mention minor points of equality, which naturally suggest themselves.

Let the second series of experiments, take place before ten or a dozen competent persons. In No. 919 of your Magazine, the results of the first series were recorded, and I trust, that you will also admit into its columns, a record of the second." The matter will then be set at rest, and the comparative merits of our inventions fully evolved. By the assent of Mr. Stevens, the trials alluded to by your correspondent, arose between his model and mine. The experiments took place at the Polytechnic Institution in presence of many spectators unknown to us both, and I cannot think that your correspondent was in error, when he denominated them "comparative." Mr. Stevens is no doubt better acquainted than myself with the, "then" imperfections of his model. Of this, however, I feel assured, that my model did not receive from the hands of the servant of the Institution any "impetus," that was not imparted to his. With these strictures on Mr. Stevens's observations, I leave the subject of a second trial of speed and power between our two models in his own hands. At this period, especially when public anxiety is wound up to the highest pitch by the recorded dangers of a "steam ship" from America, and the non-arrival of another, every subject connected with

* If the air which fills the cavity C alternately with its mercurial contents, does not rise freely through the mercury in the reservoir, it may be removed by the introduction of a small rod of glass, iron, or wood.

steam navigation assumes the greatest importance, and the damage done to the "paddle-wheels" of the *British Queen* during the late tempestuous weather, forcibly points out a less exposed means of "steam propulsion" for crossing the Atlantic.

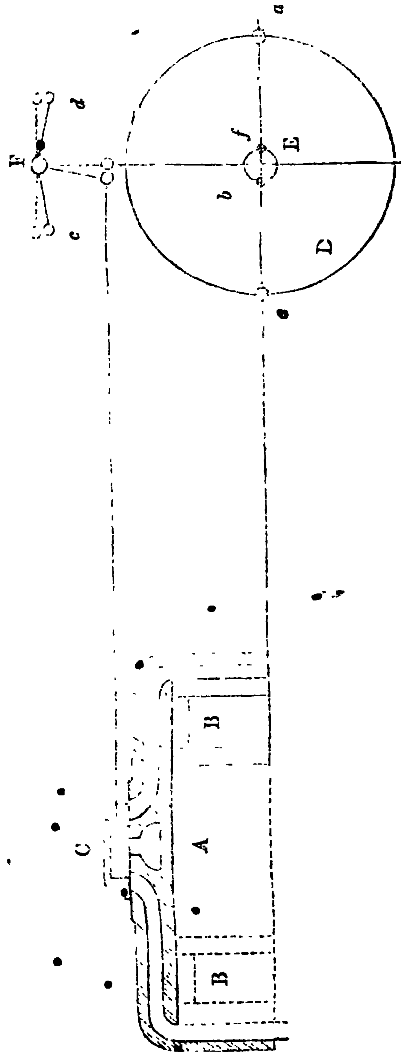
This, the experience of a few months has taught us in language, which appeals to the finest feelings of our nature. Let us therefore hope, that on public grounds the relative merits of the many inventions for steam locomotion on the ocean will be carefully examined?

Believe me to remain, your
Obedient and humble servant.
E. CARPENTER.

Stamford, April 20, 1841.

MR. PEARCE'S PLAN FOR REVERSING THE ACTION OF LOCOMOTIVE ENGINES.

Sir,—I did not suppose that the observations made by me in your 910th number, page 36, relative to the mode of reversing the motion of locomotive engines proposed by Mr. C. Pearce, would lead to any further discussion, or that much argument would be requisite to prove its fallacy. Let us, however, previous to saying any thing more on the subject, observe two things:—first, that we clearly understand what each respectively means; and, secondly, whatever we have to say to each other, let it be said without acrimony or ill feeling. I mention the latter preliminary, because I fancy I perceive in Mr. Pearce's reply to my remarks in your last monthly part, page 195, something like disingenuity. He says, "your correspondent, 'P. O. P.,' who I am inclined to think, either *does not*, or *will not* understand what he has been writing about, for it is *quite evident he has condemned what he never tried;*" now this is quite unnecessary, as being totally unknown to Mr. P., he cannot be supposed to know what I have, or have not tried; nor does it by any means follow, that because I cannot at once agree with him, that I do not, or will not understand what he means. It however so happens, that I have for some time been in pursuit of the *same* object; and although I do not profess to do so much as Mr. Pearce, or to make use of the same means, I nevertheless use but *one* eccentric (*which is immoveable*) to each engine, for working in *both* directions; and it is from experience alone that I am induced to contend, that with a fast eccentric, Mr. P. cannot, by the means he proposes, give an *equal* lead to the valve when working in *either* direction—this being what I suppose is meant.



The above diagram, which represents a portion of a cylinder with its valve, will explain my views of the subject. Let us suppose the crank to be at *a*, the piston at that end of the cylinder

nearest the crank, and the eccentric at *b*. Now if, for the purpose of argument, we assume that the valve, when at half stroke overlaps the openings ⅛th of an inch, and that when the crank is on the centre it is also ⅛th of an inch open, it will be somewhere about the position shown in the sketch—which position, Mr. Pearce proposes to give it by altering the levers from the arrangement represented by the dotted lines, to that shown by the full lines, the eccentric remaining at half stroke. Thus situated the crank may be caused to revolve in either direction, by throwing the eccentric rod into gear with the levers *c* or *d*. But let us suppose the piston to have made half a stroke, and that it now occupies the position shown by the dotted lines B, and that the crank is at *e*; the eccentric will then be at *f*, and as it again stands at half stroke, and has made just half a revolution, it must of necessity have brought the levers, and consequently the valve, to precisely their former position; but this position is now clearly wrong as regards the altered circumstances of the piston, inasmuch, as instead of being ⅛th of an inch open, it has not so much as shut off the steam from the opposite end; hence, unless there be something in Mr. Pearce's plan which I "cannot, or will not understand," I see no reason for altering my formerly-expressed opinion, that "whatever might be the amount of lead, or advance which the slide would leave in the position there shown, it would be just as much in arrear at the opposite end of the stroke."

In questioning the utility of the lead in slide valves, in my former communication I proposed to consider it without reference to the expansive principle. Mr. Pearce asks, "What has expansion to do with the lead." It has this to do with it; every slide valve when at half stroke covers the openings more or less, that is, the faces of the valve are made broader than the openings, so as to overlap them, and this is one reason why a lead is required in the eccentric; but in addition to this, it is common, especially in the Boulton and Watt D valve to give a *considerable* overlap to the steam slide, so that the opening may be closed before the piston reaches the end of its stroke, and the steam allowed to expand, which would, of course, render a still greater degree of lead necessary. It is with the latter reservation, therefore, that I question the utility of the lead in slide valves.

I may add that I have *not* tried Mr. Pearce's plan, nor, unless I very much alter my opinion of it, do I think I am at all likely to do so. I shall, notwithstanding, be much obliged by Mr. P. saying whether or not he has himself put it in practice, and if so, how it answers his expectation.

I am, Sir, yours very respectfully,

P. O. P.

April 5, 1841.

Explanation of the Engraving.

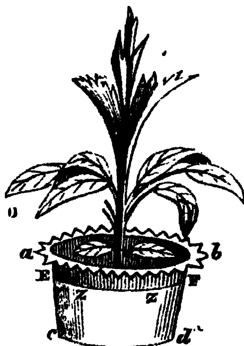
A, cylinder; B, piston; C, slide valve; D, path of crank pin; E, path of centre of eccentric; F, working gear shaft with levers for reversing.

TREGGON AND CO.'S GALVANIC PLANT PROTECTORS.

Sir,—This ingenious invention, which perfectly secures dahlias and other delicate plants from the attacks of those voracious pests of the flower garden—the mollusca, must be highly acceptable to all engaged in their culture.

During a trial of twelve months by the original inventor, it was found that not a plant was injured that had the protection of these galvanic circles, although during the same period, plants on all sides suffered severely that were not so protected.

The following drawing and description will explain its operation.



The Protector consists of a conical ring of zinc about 4 inches in height; the top end (*a b*) is flanged off about a quarter of an inch, and cut into numerous

vandyked points; immediately under is a ring of copper neatly fitted (E F).

It is thus used:—the bottom of the zinc ring (*c d*) is pressed into the soil until the lower edge of the copper ring is about one inch and a half above the surface, care being taken to inclose within the ring the rods of such plants as may require them, otherwise the molluscæ find a road to the plant by the rods. The molluscæ may crawl up the zinc with impunity, but on coming in contact with the copper, will receive a galvanic shock, and immediately turn away, or fall to the ground. If the larger of this tribe attempt to stretch across and above the copper belt, avoiding contact, they would be incapable of holding by the points.

The Protector acts in wet or dry weather, and is always in action. Its appearance in use is like a flower pot, and its cheapness, utility and durability, must insure its general adoption.

For the protection of fruit trees, the same principle is applicable.—Strips of zinc and copper are prepared by Treggon and Co., which being judiciously placed along the wall, and round the stems of each tree, effectually preserve them. T.

ON THE ACTION OF THE CORNISH SINGLE AND DOUBLE ENGINES.

Sir,—In the *Quarterly Mining Review* of January 1832, there is an article on Cornish Engines, by Mr. Elijah Galloway, civil engineer, in which an estimate has been attempted of the increase of effect due to the different causes to which the improvements in duty may be attributed. In this statement expansion of steam, by cutting off the boiler supply at ⅓rd to ⅛th of the stroke stands highest. Boiler improvements and clothing are nearly equal; but "suspending the action of the piston," "at the commencement of the stroke, and allowing time for the perfect condensation of the steam in the cylinder before making the returning stroke," is rated much below either of the other sources of improvement.

This quotation is conclusive as to the fact, that the value of complete condensation previous to the commencement of the stroke, has attracted the attention of a party who has described his experiment at Wheal Towan Engine—and who apparently refers to information derived from a personal communication with the engineers of the Cornish Mines. I do not urge it except as an opinion, *quantum valeat.*

Admitting the correctness of "Scalpel's" statement, that in quick moving rotative engines—a deficiency of effect of 3½ or 4lbs. pressure is occasioned by the delay of complete condensation until towards the end of the stroke, and that this loss is equal ¼th, or even ⅓rd of the total pressure; yet, as the Cornish claim of superiority is for a duty twice, or three times as much as that performed by other engines, it seems clear that the complete formation of the vacuum, previous to the commencement of each stroke, would be insufficient to account for the larger portion of the asserted improvements in duty.

In reference to another point, I would mention, that several diagrams taken by Mr. Henwood, in 1831, with an indicator, from Cornish lifting engines, have been published in vol. 2, of the "Trans. of the Ins. of Civil Engineers." By these, expansion is shown to have been carried out to a great extent, and consequently, that the steam on the piston has a much greater pressure at the commencement than towards the end of the stroke.

It would be a singular instance of the discordance of theory and practice, if it should be proved that the piston of the Cornish engines "moves so very slowly as never to feel any uncondensed steam beneath it." I do not dispute the latter fact, as due to other causes, but only the slow motion of the piston *itself*; the injurious effect of facts incorrectly observed or stated, requires from "Scalpel" some proof of an assumption that does not seem to agree with the result, that might have been expected of a rapid motion of the piston at starting, with a retardation towards the end of the stroke; at the same time, I do not conceive the rapid or slow motion of the piston, will materially affect the value of complete condensation, at an early part of, or before the stroke is began; neither does the high duty of the rotative stamping engines referred to in my letter of the 7th of February, affect this question; since the number of their revolutions seldom, if ever, exceed 10 per minute; and consequently, even in the double engines, an appreciable time occurs while the engine is passing the centres, during which

condensation may be effected; and the single acting can be managed in the same manner as lifting engines.

I ought perhaps to add, that it happened that none of the older stamping engines, were reported in December, and that I omitted to state, that the two double-acting engines have cylinders of 36 in. in diameter, and the single engines of 32 inches in diameter, (nearly the same as those of the lifting engines), whose monthly duty was less—in the proportion of 36 to 51.

Not a shadow of doubt can be entertained of the advantage of complete exhaustion in the cylinder before the piston begins its stroke — though much difference of opinion may exist, whether the superior duty of the Cornish-lifting engines is more owing to this cause than to any other. I would suggest that some inquiry is requisite into the amount of steam room in Trevithick's mining boilers—whether, in the larger engines sufficient space is allowed to supply steam for more than six or seven strokes per minute to advantage.

I remain, Sir,

Your obedient servant,

S.

April 10, 1841.

IMPROVED DOOR CATCH.

Sir,—I take the liberty of forwarding to you a drawing and description of an improved "Door Catch;" if you think it worthy of a place in your valuable Magazine, you will much oblige me by inserting it.

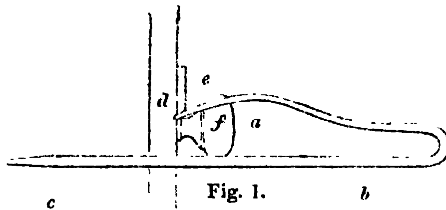


Fig. 1.

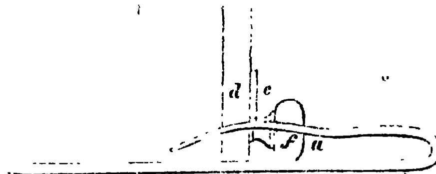


Fig. 2.

a b c, is a steel spring, one end of which, *c*, is driven into the door cheek; *d* is the door, to which is screwed a plate of iron *e*, and the handle *f*. As the door *d* is opened, the spring is bent till it assumes the form represented in fig. 2, and on being opened further, it recovers its original shape. The advantage of this catch, over that commonly in use is, that the handle requires no turning, the door opening by merely pushing it. I have one in my door in continual use, and find it answer the purpose.

I remain your humble servant,

T. B.

January 1, 1841.

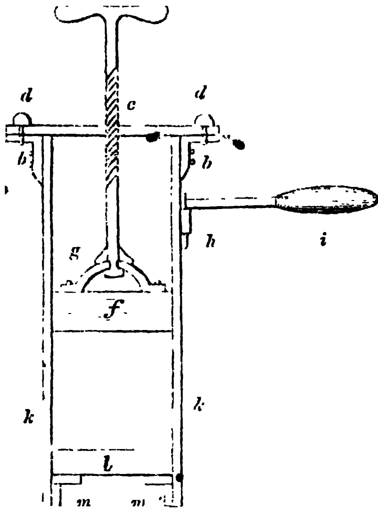
PORTABLE TINCTURE PRESS.

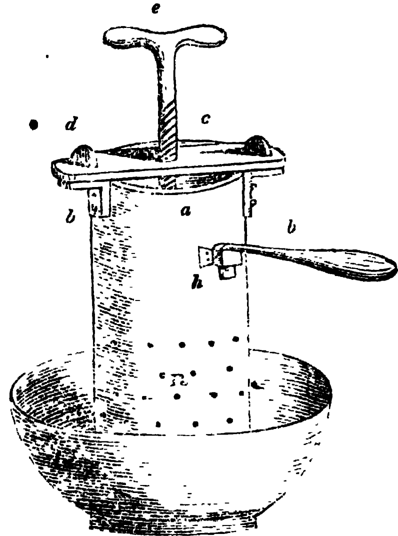
Sir,—I have employed for several years a portable press similar to the accompanying sketches for extracting the fluid from the ingredients used in making of tinctures, decoctions, &c.

The press is portable, effective in its operation, and so simple in its formation, that any smith or tinman could make it in a few hours. The one in my possession is made of block tin. If you deem it worthy a place in your valuable journal, you will oblige by its insertion.

I am, Sir, your obedient servant,

C. WILLIAMS.





Description.

a, a cylinder of tin, 12 inches long by 4 in diameter; *b b*, ears of iron fastened to the cylinder by one extremity, the other perforated by a screw hole, in which the thumb screw works; *c c*, strap of iron, $1\frac{1}{2}$ inch broad, $\frac{1}{4}$ thick, and 6 inches long, with a screw hole for the lever (*c*) and a slot hole at each end for the head of the thumb screw (*d d*); *d d*, thumb screws, the flat heads of which pass readily through the slot holes in the cross piece (*c*); one or two turns of the screw is sufficient to secure it firmly on the top of the cylinder; *e*, the lever, made of a piece of round iron $\frac{1}{2}$ inch thick and 16 inches long, with a coarse thread cut nearly one-half of its whole length; *f*, a circular piece of beech, 2 inches in thickness; *g*, a strap of iron slightly bent, and fastened to the block of wood (*f*), by two wood screws; the bottom part of the screw (*e*), is loosely rivetted to it; *h*, a small flat iron staple fixed to the side of the cylinder for the reception of the bent point of the handle (*i*); *k*, small holes punched in the side of the cylinder; *l*, a circular piece of beech resting on the iron supporters (*m*) at the bottom of the cylinder; *n*, a common earthenware bason, in which the press is placed and the fluid received.

Operation.—See that all the perforations (*k*) are free, place the circular block of wood (*l*) at the bottom of the cylinder on the projections (*m*), then put into it the ingredients taken from the fluid part of the decoctions or tinctures; on this place the block (*f*); secure the cross piece (*c*), by turning the screws (*d d*), and let their shoulders cross the slots; place the press in a common bason; fix the handle in the staple (*h*), and with the left hand hold it firmly, so as to make the cylinder stationary; then with the right turn the screw (*c*) until the fluid cease to flow from the perforations. By this simple operation every particle of fluid is extracted from the solid matter.

The gums of plants can be treated in a similar manner for the purposes of extracts.

THE CALCULATOR, NO. XI.—TITHE COMMUTATION.

Sir,—A very important and beneficial act of legislation has substituted for the antiquated system of tithes, a rent charge, the annual amount of which is made dependant upon septennial averages of the price of grain. As the value of wheat, barley, and oats severally enter into these averages, they necessarily give occasion to much calculation, the nature of which, perhaps, may interest some of the readers of the *Mechanics' Magazine*.

If W, B, O, be the average prices of a bushel of wheat, barley, and oats, for any year, expressed in fractions of a pound sterling, the value P for the ensuing year, of a rent charge apportioned at R, will be

$$P = R[0{\cdot}949555\,W + 1{\cdot}68421\,B + 2{\cdot}42424\,O].$$

These co-efficients are very nearly in arithmetical progression, the differences being 0·734655, and 0·74003; the ratio also between the average prices of barley and oats is nearly constant, viz. 1·436 : 1. These two circumstances may be taken advantage of to change the expression into a form having only 2 instead of 3 independent terms.

But $\cdot 949555 + y + z = 1{\cdot}68421$

$\therefore 2y + 2z = 1{\cdot}46931$

And $\cdot 949555 + 2y - 1{\cdot}436z = 2{\cdot}42424$

$\therefore 2y - 1{\cdot}436z = 1{\cdot}47469.$

Subtracting the second equation from the first, and dividing by 3.436, there result $z = -0{\cdot}001565$, $1{\cdot}436z = -{\cdot}002247$, and $y = 0{\cdot}73622$. Therefore

$$P = R[\cdot 949555\,W + (\cdot 949555 + \cdot 73622 - \cdot 001565)\,B + (\cdot 949555 + 1{\cdot}47244 + \cdot 002247)\,O]$$

$$= R\left[\cdot 949555\,(W + B + O) + \cdot 73622\,(B + 2O) - \frac{\cdot 002247}{1{\cdot}436}\,B + \cdot 002247\,O\right]$$ or otherwise

$$R[1{\cdot}685775\,(W + B + O) - \cdot 72622\,(W - O) - \&c.$$

The last two terms, upon the hypothesis chosen, exactly destroy each other; and using the first two terms in their second form, we deduct the following rule.

In making out a tithe rental for use, add two columns A and B, exhibiting the product of each original rent charge, by the two factors last shown. Then, to find the actual rent charge for any year, multiply A by the sum of the *Gazette* prices of the three kinds of grain, and also B by the difference between wheat and oats. Subtract the latter product from the former, and the remainder is the value sought, in the same denomination as the prices used in forming the multipliers. Shillings will probably be most convenient.

Having examined the septennial averages for 20 years past, it does not appear that at the maximum variation of the ratio above adopted, an error exceeding a halfpenny in 100*l*. can arise from the rejection of the two minute terms of the formula.

J. W. WOOLLGAR.

Lewes, 24th April, 1841.

ANSWER TO THE CAMBRIDGE MATHEMATICAL QUESTION.

Sir,—In your Magazine for Feb. 6, No. 913, page 123, the following question is proposed: Viz.

$$z + y + xy = a$$

$$(x^2 + y^2) \times zy = b$$ to determine the values of x and y in the terms of a and b.

I find them as follows: Viz. $x = a$, or $s\,(-b-1)$ and $y = 2a$.

I am, Sir,

A YOUNG ALGEBRAIST.

Bromley, March 11, 1841.

MODE OF PREVENTING COLLISIONS AT SEA.

Sir,—Not having yet heard of any measures having been taken for preventing collisions at sea, I hope you will give insertion to the following in the *Mechanics' Magazine*, which I think will be found useful towards preventing the sacrifice of human life, which of late has become so very common. I am induced to offer the following methods in hopes that they may be improved upon by more competent persons than myself. I would have every *steam* vessel carry a light on each of her paddle boxes, and whether she be large or small, let the lights be placed at some specified distance apart, say 40 feet; which may be easily managed, by small vessels having a

couple of staples fixed on each paddle-box; and suppose the vessel to be 30 feet over all across paddle boxes, she will then require an iron rod projected 5 feet over each side, with the light affixed on the outward end and the inboard, and secured by the staples, they being about 3 or 4 feet apart, which will keep the lights steady, and will be easily removed with the iron rods when not in use. But if the vessel be more than 40 feet over all, then she may carry the lights *on* the paddle boxes, so as to bring them to the specified distance whatever that may be. My object in having a known distance between the lights is to enable persons to judge very nearly their distance and bearing, which I think they would plainly indicate; for suppose a sailing vessel observe two lights at a short distance off, and the lights appear to be (say) 10 feet apart, it is then certain that the vessel carrying the lights is not coming directly towards the sailing vessel, but must be going in an oblique direction, and all is well; and the course of the vessel will be soon known by the position of the lights varying. But if, when the lights are first discovered, they appear but a short distance apart, and that distance apart seems gradually to increase, then it may be supposed she is coming stem on towards the sailing vessel, which must then alter her own course, so as to diminish the apparent distance between the observed lights, and by this means avoid collision. I would also have it understood as a general rule, that upon vessels nearing each other in the dark (and all my observations of course allude to darkness or fog), that vessel which first discovers the other shall ring her bell *once* if she starboards her helm, and if she ports her helm let her bell be rung *twice*; this will of course tell the other what to do, and will prevent that dodging, which at sea causes vessels, and on shore causes persons to run against each other, through the one not knowing which side the other intends passing. I would also propose that the lanterns be made *square*, and that each bull's eye, or square of glass be of different colours, to indicate the cardinal points; for instance, suppose Red to indicate the North; White the South; Blue the East; and Yellow the West. Suppose further, that the vessel carrying the lights is steering to the North, then let her show her *Red lights* in front on each paddle-box, and if steering to the south-east, let her show the White light in front on the south or starboard paddle box, and the blue in front on the eastern or larboard side. And by this means she may plainly intimate her course whatever it may be.

It might also be advisable for vessels in certain latitudes, or on nights particularly dark, to have a Bude, or other strong light ready to exhibit at a short notice, so that upon observing a vessel suddenly coming upon her in a dangerous manner, she would be able by that means so to illuminate her own hull and rigging as to prevent collision.

I feel, Sir, that I am already encroaching upon your time, or I should endeavour to make my observations more plainly understood, but if you can find a corner in your valuable work for the insertion of the foregoing, I may perhaps turn my attention more towards this important subject at a future time.

I remain, yours, Sir, respectfully,

CHARLES NEWNHAM.

Lambeth, April 2, 1841.

LAWS OF FALLING BODIES.

Sir,—Your correspondent, Mr. Davison, has furnished us with some strange calculations (No. 922) on the subject of falling bodies. He calculates that a body placed at the distance of the moon, would, on falling to the earth acquire a final velocity of 281,408 feet per minute; he also calculates, that another body placed at ten times the distance of the moon, would only acquire (on reaching the earth) a final velocity of 88,961 feet per minute, and by the same rule (viz. Mr. D.'s rule) if a body were to fall from a distance equal to that of the sun, the last acquired velocity would only be 14,067 feet per minute, or the greater the distance fallen from, the less will the final velocity be (!). Strange results these are, Mr. Editor (if true), and the only requisite necessary for their belief would be to be well crammed with credulity. Mr. Davison himself seems rather surprised at the results of his own handiwork, although he endeavours to hitch the whole blame from his own shoulders upon that of Newton, for he tells us, "in this demonstration, I have adhered strictly to the rule laid down by Newton, and the results show that it does not

agree with theorems laid down by writers on mechanics for uniformly accelerated motion, nor does it agree with what we *see* around us," &c. Well, Mr. D., let us see. The theorem for finding the velocity given by the writers on Dynamics, is $v = \sqrt{2gs}$, where s is the height fallen from, and g the measure of gravity at the earth's surface. Now this theorem for finding the value of v is only true when s is a small quantity not exceeding three or four miles. It never was intended for reaching the moon, or even 50 miles above the earth's surface.

The true and universal theorem for all possible values of s is $v = \sqrt{2gr \times \frac{d-r}{d}}$; where, d is the distance of the body from the earth's centre, r the radius of the earth, and g the measure of gravity at the earth's surface, and this last theorem is deduced from Newton's General Law, viz. "that the force of attraction varies inversely as the square of the distance of the body from the centre of attraction." Assume, $d-r=s$, then, on the supposition that the height s above the earth's surface does not exceed two or three miles, in that case we may safely substitute d for r; then we have $v = \sqrt{\frac{2gd \times s}{d}} = \sqrt{2gs}$. And this theorem was first discovered by Galileo. And further, it is manifest that the greater that d is, the greater will $\frac{d-r}{d}$ be; for $\frac{d-r}{d} = 1 - \frac{r}{d}$, and as d increases, the value of the fraction $\frac{r}{d}$ diminishes, that is, the greater the distance the body falls from, the greater will the value of the expression $\sqrt{2gr \times \frac{d-r}{d}}$ be, or in other words, the greater will the velocity be. And thus it appears from Newton's own theorem, that the results are just the reverse of what Mr. Davison (by a misapplication of principles) has endeavoured to establish. Mr. D is prodigiously out in the arithmetical value of the final velocity. Thus let $r=$ 3970 miles, then the mean distance between the the earth's centre and the moon, is $60\,r = 238{,}200$ miles, and $d - r = 234{,}230$; and the final velocity in feet per second will be

$$v = \sqrt{\frac{2gr \times (d-r) \times 5280}{d}} = \sqrt{\frac{3970 \times 64\frac{1}{3} \times 5280 \times 234230}{238200}} = 36411$$

feet, or 6 miles 1577 yards. The velocity calculated by Mr. D. by his own rule is only 1563 yards per second.

The theorem for finding the time from Newton's General Law is of a more complicated form (the investigation of both theorems require a knowledge of the fluxionary or differential calculus,) and to render it intelligible requires a diagram.

B is the point from which the body is supposed to fall; C the centre of the earth, and B D C, a semicircle described upon B C, and A D a tangent drawn from A to meet the semicircle in D. Then B C = d, A b=r. The time in seconds will be expressed by the equation $t'' = \frac{1}{2}\sqrt{\frac{2d}{g}} \times \frac{BD+AD}{r}$, and when d and r are given in miles, $t'' = \frac{1}{2}\sqrt{\frac{2d \times 5280}{g}} \times \frac{BD+AD}{r}$.

Arithmetical Calculation.

1st. $AD = \sqrt{AB \cdot AC} = \sqrt{234230 \times 3970} = 31935.76$.

2nd. The length of the arc, B D, computed by the ordinary process of mensuration will be found to be 342622.93; consequently,

3rd. $\frac{BD+AD}{r} = \frac{374558.69}{3970} = 94.3473$.

4th. $\frac{1}{2}\sqrt{\frac{2d \times 5280}{g}} = \frac{1}{2}\sqrt{\frac{476400 \times 5280}{32\frac{1}{6}}} = 4421.502$; and, lastly, $t'' = 4421.502 \times 94.3473 = 417157$ seconds $= 4^d..19^h..52^m..37^s$.

The investigations of the two general theorems used in the above calculations are given in Simpson's Fluxions, and also in the 2nd vol. of the Woolwich Course.

Mr. D. in his first expression $t'=(t'$ being the time in minutes) $\sqrt{\frac{1236734400}{16}}$, has allowed for the diminution of gravity at the distance of the moon, and in imitation of the theorems given for falling bodies where the distance fallen from is small, he supposes this force to remain constant for the whole time of descent, and hence arises the absurd results produced by his calculations.

I am, Mr. Editor, yours, &c.

IVER McIVER.

April 12, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

**** Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

WILLIAM NEWTON, OF CHANCERY-LANE, MIDDLESEX, CIVIL ENGINEER, *for certain improvements in engines to be worked by air or other gases.*—Petty Bag Office, April 15, 1841.

To the upper part of a cylindrical generator formed of thin sheet metal, is attached a cast iron stuffing box, on the top of which a copper cup is placed for holding cold water, two similar cups being also placed beneath the stuffing box. Heat is communicated to the generator by a furnace placed beneath it. The piston is a thin copper cylinder, and to a ring at its top is attached a hollow frustrum of a cone, kept filled with water.

An inner cylinder or plunger is formed in two parts, the lower part being cylindrical, and formed with a hollow cone, to fit the cone of the piston.

The action of the engine is as follows:—As soon as the piston has attained the bottom of its stroke, the plunger is raised, and the air which was contained in the space between the lower part of the piston and the top of the plunger, made to descend into the lower part of the generator, where, being expanded by the heat, it forces the plunger up higher, and continuing to expand, at length forces the piston and plunger to the highest point of the upward stroke; the plunger then descends, and drives the expanded air up into the space between it and the piston, where it is cooled by the water in the several cups, contracted, and again forced down to the lower part of the generator as before. In another modification, in lieu of the water in the cups, the air is cooled and contracted by the injection of water in a finely divided state.

THE RIGHT HONOURABLE FRANCIS, EARL OF DUCIE; RICHARD CLYBURN, OF ULEY, ENGINEER; AND EDWARD BUDDING, OF DURSLEY, IN THE COUNTY OF GLOUCESTER, *for certain improvements in machinery for cutting vegetable and other substances.*—Petty Bag Office, April 15, 1841.

The cutter, which is rotary, consists of one or more knives coiled spirally round a cylinder, or upon a hoop, wheel, or disc, the cutting edges being placed at an angle with the centre of the coil, so that by removing a portion of their outer edges, bevil knives are formed, which will make a clean cut. In some cases it is desirable to make the cutting edges serrated, and this is done by grooving them in one direction like float-cut files; then by grinding their upper side, a toothed or serrated edge is formed. The speed of the feeding rollers of chaff-cutting machines, to which the rotary cutter has been applied, is regulated as follows:—At one end of the axis of the rotary cutter there is a cap with a single and double-threaded screw cut upon it; a worm wheel, which takes into one of these screws, is fastened to one end of a short shaft, the other end carrying a pinion, which drives a second pinion on the end of the lower feeding roller. If it is desired to cut hay, &c. into small pieces, the worm wheel is geared into the single-threaded screw; if larger pieces are required, the double-threaded screw is used, and the rollers thereby driven at double their former speed.

The claim is to the application and use of the peculiarly formed knife or edged tool herein described, for the purpose of cutting or operating upon heather, turnips, mangel wurzle, tobacco, dye woods, &c.; also the mode of regulating the speed of the feed rollers of chaff-cutting machines, and likewise the formation of serrated edges on the rotary knife or cutter.

JAMES HANCOCK, OF SIDNEY-SQUARE, MILE-END, CIVIL ENGINEER, *for an improved method of raising water and other fluids.*—Petty Bag Office, April 15, 1841.

This invention consists in an improvement on the "rope pump" of the ancients, or the "hydraulic belt" of the moderns.

The band employed in this case consists of three parts—viz., the non-absorbent part, which the patentee calls the foundation; the absorbent part, or useful elevating portion; and the outer net or covering, which is used to secure and protect the absorbent surface.

The foundation is made in either of the following ways:—Two pieces of hempen

cloth, or other strong fabric, are covered on one side with a solution of caoutchouc, prepared by steeping caoutchouc in coal oil, or oil of turpentine, or a mixture of both sufficient to dissolve it; when dissolved it is strained, and then used. When this coat is nearly dry—*i. e.*, when "tacky"—the two pieces are pressed together by passing them through rollers.

Another foundation is formed of a warp of iron, or other metallic wires, either alone or mixed with threads of animal or vegetable material; and in the weft of one or more of the same substances, and this fabric is placed between the two pieces of cloth before mentioned.

The absorbent part is formed by cementing pieces of sponge all over the foundation with the caoutchouc solution, which is then covered with net work, sewed or otherwise attached thereto. Or the absorbing part may be prepared in any of the following ways:—Of a fabric of list or cloth, covered with sponges; of cylinders of net work filled with cork, sponge, hair, wool, &c.; of a hair and whalebone brush; or ropes of hemp, hair, pieces of skins, or hides of animals either prepared or in their natural state.

The compound band prepared in one of the above ways is securely joined together at the ends, and placed round two rollers, one of which is immersed in the fluid to be raised, the other at the height at which the fluid is to be discharged. Motion from any available source being communicated to the rollers, the endless band revolves and raises the fluid in the manner peculiar to machines of this kind.

The claim is—1. To the application to raising water and other fluids, of an endless band, whereof one portion is non-absorbent, and the other portion is absorbent of the water and other fluids.

2. To the application to raising water and other fluids, of a basis or foundation made as herein described.

3. To the application to raising water and other fluids, of sponges, when attached to a basis or foundation, as herein described.

4. To the application to raising water and other fluids, of a fabric of list or cloth, and tufts of sponge, as herein described.

5. To the application to raising water and other fluids, of cylinders of net work, filled with sponge, cork, hair, or wool, as herein described.

6. To the application to raising water and other fluids, of hemp, hair, pieces of skins or hides of animals, when attached to a basis or foundation, as herein described.

7. To the application to raising water and other fluids, of the horse hair or whalebone brushes, as herein described.

8. To the application to raising water and other fluids, of net work, when used as a protection, covering, or security to an absorbing surface, as herein described.

ROBERT PETTIT, OF WOODHOUSE-PLACE, STEPNEY GREEN, GENTLEMAN, *for improvements in railroads, and in the carriages and wheels employed thereon.* Petty Bag Office, April 15, 1841.

The improvements in railways consist in the employment of rails of various forms: one is a flat iron bar on which the wheels run divested of their flanges, their position on the rails being maintained by horizontal wheels attached to vertical shafts beneath the carriages, which run in contact with a centre rail. Horizontal wheels without the centre rail are used, which in that case run in contact with the inside of the working rails, the rails being provided with a top flange to prevent the wheels from rising above the rails. When the first kind of rail is employed, the centre rail is made to serve the purpose of switches: a portion of it, where the rails diverge, turns on a pivot, the other end being moved by a connecting-rod and lever in the usual manner; the horizontal wheels following the direction of the centre rail, guide the carriages on to the right line of rails.

One of the methods of retarding railway carriages, consists of a horizontal shaft at the top of the carriage, attached at each end to the upper end of a rocking lever, and also to two connecting rods, to the other ends of which are fastened the upper ends of two other rocking-levers; to the lower ends of each of these levers a break is fastened, and another break is attached to each of them by a connecting link; another break is likewise placed above the antifriction roller with which the wheel is provided.

When it is desired to bring up a train, the horizontal shaft is moved by a screw, which causes the rocking levers to apply the breaks which are attached to them, the motion of which also forces back a bar attached to the upper breaks and brings them simultaneously into action.

The second mode of retarding railway trains is that, which we fully described and illustrated in our last number.

The claim is 1- to the improved construction and arrangement of railways.

2. To the improvements relating to the construction of the carriages and the apparatus attached thereto.

3. To the combination or arrangement for arresting the progress of trains on railways.

LIST OF DESIGNS REGISTERED BETWEEN MARCH 23RD AND APRIL 27TH.

Date of Registration. 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
March 23	644	H. I. and J. Dixon	Carpet	1 years.
25	645	J. Sheldon	Label	1
,,	646	J. Smeeton	Spring for waistcoats, &c.	1
,,	647	C. F. Smith	Lamp Chimney	3
29	648	T. Hopkins	Carpet	1
30	649	W. Milligan	Weavers shuttle	3
,,	650	W. Hancock	Letter file	3
,,	651	R. Goodlad and Co.	Stained paper	1
April 1	652	H Jones	Oven	3
2	653	J. Walker	Flooring cramp	3
,,	654	D. Morison	Design for book backs	1
5	655	Crosse and Blackwell	Lamp glass	1
,,	656	W. J. Curtis	Railway crossing	3
6	657	Wright and Cramp	Carpet	1
,,	658	Smith, Taylor, and Co.	Stove	3
,,	659	Welch and Margetson	Gaiter, &c., fastener	3
,,	660	W. Stidolph	Hand guide for blind writers	3
7	661	Pendrell and Nichols	Pencil case	3
,,	662	Ditto	Penholder	3
,,	663	Ditto	Ditto	1
,,	664	Davis, Brothers	Tenometer	3
12	665	Johnson, Cammell, and Co.	File	3
,,	666	W Aston	Button	3
14	667	J. Atkins	Metal reed	3
15	668	J. Smith	Illuminated glass houses	1
16	669	J. F. J. Caplin	Dress model	1
19	670	Holston, Sheppard, and Walham	A measure	1
,,	671	Welch and Margetson	Buckle	3
20	672	J. Yates	Fender	3
,,	673	The Carron Company	Ditto	3
,,	674	S. King	Chimney pot	3
21	675	J. Gough and Sons	Carpet	1
,,	676	C Houghton	Mallet	3
23	677	T. Hopkins	Carpet	1
26	678	J. and F. Harwood	Inkstand	3
27	679	J. J. Hollingshead	Pen	3
,,	680	Dovey and J. Hawkesford	Screw	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 29TH OF MARCH AND THE 27TH OF APRIL, 1841.

James Tildesley, of Willenhall, Stafford, factor, and Joseph Sanders, of Wolverhampton, lock manufacturer, for improvements in locks. March 29; six months to specify.

George Evans, of Dorset-place, Marylebone, for an improvement or improvements upon trusses for the relief of hernia. March 29, six months.

Alexander Parkes, of Birmingham, artist, for certain improvements in the production of works of art in metals by electric deposition. March 29; six months.

John Lindsay, of Lewisham, esquire, for improvements in covers for water closets, night stools, and bed pans. March 29; six months.

James Furnival, of Warrington, currier, for an expeditious mode of unhairing, mastering, and tanning various descriptions of hides and skins. March 29; four months.

Thomas Gore, of Manchester, machine maker, for certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, silk, wool, and other fibrous materials. March 30; six months.

John Oram, of Chard, Somerset, machinist, for improved machinery or apparatus for making or manufacturing netted fabrics. March 31; six months.

William Jenkinson, of Salford, machine maker, for certain improvements in machinery for preparing and spinning flax, silk, and other fibrous substances. March 31; six months.

Joseph Gaury, of Watling-street, warehouseman, for a parachute to preserve all sorts of carriages using axletrees from falling or injury upon the breaking of their axletrees. (A communication.) March 31; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in the construction of screwing stocks, taps, and dies, and certain other tools or apparatus or machinery for cutting and working in metals. April 3; six months.

James Ogden, of Manchester, cotton spinner, and Joseph Grundy Woollam of Manchester, aforesaid, commission agent, for certain improvements in looms for weaving. April 3; six months.

William Edward Newton, of Chancery-lane, civil engineer, for certain improvements in the process, mode or method of making or manufacturing lime, cement, artificial stone, and such other compositions, more particularly applicable for working under water, and in constructing buildings and other works which are exposed to damp. (A communication.) April 3, six months.

Zacharia Bryant, of Nottingham, machinist, for an improved method of manufacturing cloth and other fabrics from woollen, cotton, flax, silk, and other substances. April 3; six months.

James Anderson, of Newcastle-upon-Tyne, engineer, for improvements in windlasses. April 5; six months.

William James Barsham, of Bow, gentleman, for improvements in fastening buttons and other articles on to wearing apparel and other descriptions of goods or manufactures. April 5; six months.

Henry McEvoy, of Graham-street, Birmingham, hook and eye maker, for improvements in fastenings

for bands, straps, and parts of wearing apparel. April 5; six months.

Jonathan Beilby, of York, brewer, for improvements in brewing. April 5; six months.

William Hutchinson, of Sutton-on-Trent, Nottingham, seed crusher and oil cake manufacturer, for certain improvements in the manufacture of oil cake or seed cake. April 5; six months.

William Littell Tizard, of Birmingham, brewer, for certain improvements in apparatus for brewing. April 5; six months.

Joseph Wilson Nuttall, of Belper, draper, and Henry Holden, of the same place, tailor, for improved apparatus to be attached to trowsers, commonly called trowsers straps. April 5; 6 months.

Joseph Apsey, of Cornwall-road, Lambeth, engineer, for improvements in the construction of flues for steam boilers and other furnaces. April 6; six months.

Christopher Edward Dampier, of Ware, gentleman, for improvements in weighing machines. April 15; six months.

Frank Hills, and George Hills, of Deptford, manufacturing chemists, for certain improvements in the manufacture of sulphuric acid and carbonate of soda. April 15; six months.

Henry Augustus Wells, of Saint John's Wood, gentleman, for certain improvements in the manufacture of woollen cloths. April 17; six months.

Peter Kendall, of Gifford's Hall, Suffolk, esq., for an improved method or methods of connecting and disconnecting locomotive engines and railway carriages. April 17; six months.

Joseph Barker, of Regent-street, Lambeth, artist, for improvements in measuring aeriform or fluid substances. April 20; six months.

Joseph Bentham, of Bradford, weaver, for improvements in weaving. April 22; six months.

Henry Brown, of Codnor-park iron works, Derby, iron manufacturer, for improvements in the manufacture of steel. April 22; six months.

Thomas Harris, of Hales Owen, Birmingham, horn button manufacturer, for improvements in the manufacture of what are called horn buttons, and in the dies to be used in the making of such descriptions of buttons. (Partly a communication.) April 22; six months.

Humphrey Jefferies, of Birmingham, button maker, for improvements in the manufacture of buttons. April 22; six months.

John Rostron, of Edenfield, Lancaster, manufacturer, and Thomas Welch, of Manchester, manufacturer, for certain improvements in looms for weaving. April 22; six months.

Floride Heindrychx, of Fenchurch-street, engineer, for certain improvements in the construction and arrangement of fire-places and furnaces, applicable to various useful purposes. April 21; six months.

Lancelot Powell, of Clydach Work, Brecon, iron master, and Robert Ellis, of Clydach, aforesaid, agent, for certain improvements in the manufacture of iron. April 24; six months.

Thomas Robinson, of Wilmington-square, for improvements in drying wool, cotton, and other fibrous materials in the manufactured and unmanufactured state. April 27; six months.

William Petrie, of Croydon, Surrey, gentleman, for a new mode of obtaining a motive power by voltaic electricity applicable to engines and other cases where a motive power is required. April 27; six months.

Alexander Southwood Stocker and Clement Heeley, both of Birmingham, manufacturers, for certain improvements in pattern and clog ties and other articles of fastenings of dress. April 27; six months.

Benjamin Rankin, of College-street, Islington, gentleman, for a new form and combination of and mode of manufacturing blocks for pavement. April 27; six months.

Osborne Reynolds, of Belfast, Ireland, clerk, for improvements in paving streets, roads, and ways. April 27; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22ND MARCH, AND THE 22ND APRIL, 1841.

Joseph Stubbs, of Warrington, Lancaster, file manufacturer, for certain improvements in the construction of screw wrenches and spanners, for screwing and unscrewing nuts and bolts. Sealed, March 26. (A communication from abroad.)

George Henry Fourdrinier, and Edward Newman Fourdrinier, both of Hanley, Stafford, paper makers, for certain improvements in steam engines for actuating machinery, and in apparatus for propelling ships and other vessels on water. March 31. (Being a communication from abroad.)

William M. Kinley, of Manchester, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics. March 31.

Charles Green, of Birmingham, Warwick, gold plater, for improvements in the manufacture of brass and copper tubes. April 1.

Henry Newson Brewer, of Jamaica Row, Bermondsey, Surrey, mast and block maker, for an improvement or improvements in wooden blocks for ships, rigging, tackles, and other purposes where pullies are used. April 7.

John Barber, of Manchester, Lancaster, engraver, for certain improvements in machinery for the purpose of tracing, or etching designs or patterns on cylindrical surfaces. April 8.

George Blaseland, of Greenwich, Kent, engineer, for an improved mode of propelling ships and vessels at sea, and in navigable waters. April 8.

James Pilbrow, of Tottenham, Middlesex, engineer, for certain improvements in steam engines. April 8.

Robert Pettit, of Wood House Place, Stepney Green, Middlesex, gentleman, for improvements in railroads, and in the engine carriages and wheels employed thereon. April 12.

William Samuel Henson, of Allen-street, Lambeth, Surrey, engineer, for certain improvements in steam engines. April 14.

Henry Bessemer, of Percival-street, Clerkenwell, Middlesex, engineer, for a new mode of checking the speed of, or stopping railroad carriages under certain circumstances. April 20.

Hugh Graham, of Bridport Place, Hoxton New Town, Middlesex, artisan, for an improved manufacture of that kind of carpeting usually denominated "Kidderminster Carpeting." April 21.

LIST OF IRISH PATENTS GRANTED FOR MARCH, 1841.

John Clay, for improvements in arranging and setting up types for printing.

Robert Cooper, for improvements in ploughs.

Peter Bradshaw, for improvements in dibbling and drilling corn, seed, plants, roots, and manure

Charles Payne, for improvements in salting animal matters.

James Molyneux, for an improved mode of dressing flax and tow.

James Davis, for improvements in the manufacture of soap.

Fredrick Steiner, for improvements in looms for weaving, and cutting asunder doubled (piled) cloths, and a machine for winding weft for use therein.

John Whertheimer, for certain improvements in preserving animal and vegetable substances and liquids.

W. R. Westly, for certain improvements in carding, combing, straightening, cleaning, and preparing for spinning, hemp, flax, and other fibrous substances.

William W. Murray, for certain improvements in machinery used in the manufacture of paper.

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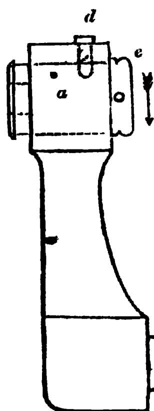
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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 926.] SATURDAY, MAY 8, 1841. [Price 3d.

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Mr. HOLEBROOK'S PLANS FOR DISCONNECTING PADDLE-WHEEL SHAFTS FROM ENGINES.

Fig. 1. Fig. 2.





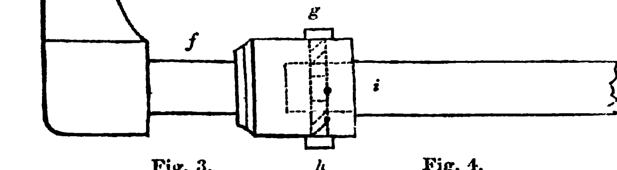
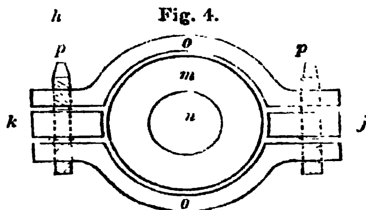


Fig. 3. Fig. 4.



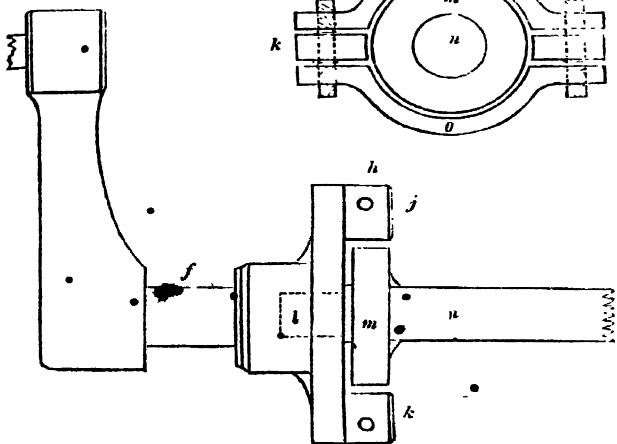
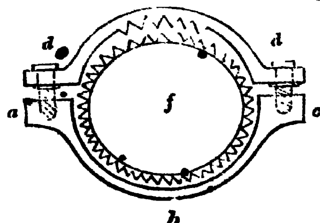


Fig. 5.



METHOD OF DISCONNECTING PADDLE-WHEELS.—BY J. P. HOLEBROOK, ESQ.

Sir,—Reading the account of the first trial of the *Driver* and *Ardent* steam frigates in your last week's Magazine reminded me of an intention I expressed, in my communication inserted in your 893rd number, and mentioned at page 306, of sending you an account of a plan I had devised for the purpose of disconnecting the paddle-wheels from the engines, at any position in which they might by accident happen to be found. One of the following methods, for readily accomplishing this purpose, is that I originally intended to send you; and this, I trust, with the other plans, since contrived, and about to be described, will sufficiently redeem the intention to which I have just alluded.

The most steady means of disconnecting the wheels from the engines, appears to be that of releasing the cranks from the rods which connect these (the cranks,) with the engines; but the after adjustment to the cranks of these rods, when it is again desirable to connect the wheels, requires an amount of time which does not seem to be either allowable or advisable. It has therefore been proposed by some to withdraw the crank pin by unscrewing it; but this mode infers the disturbance of both ends of the crank pin, and is so far liable to some objection. Mr. Samuel Seaward's ingenious and beautiful plan of releasing the toe of the crank pin, from its housing in the end of the paddle-shaft crank arm, leaves the head of the crank pin firmly fixed, and diminishes the amount of objections to any before-contrived plan of disconnection.

Acting upon the assumption, that it is most desirable to effect the disconnection at the crank pin, I have contrived a plan which effects the release of the toe of the crank pin by the recession of a socket from it. This plan is shown in figures 1 and 2, which I will now describe. Fig 1 (see front page) represents a lateral view of that arm of the crank which is next the paddle-wheel. At the end *a*, there is a hole large enough to allow of sliding in it a piece of round iron of the form shown in fig. 2. At the end *b*, of this piece of iron, there is a sunk circular hole, just large enough to receive the toe of the crank pin; a sectional view of this hole is shown by the dotted lines in fig. 2. In the middle of this figure (fig. 2) is seen a curvilinear groove having darkened circular parts at each extremity, these darkened parts representing deepened circular holes. At the end *c*, fig. 2, is an enlarged circular part pierced with holes at equal distances. On the top of the crank (fig. 1), will be seen a screw marked *d*, the object of which is to retain in a fixed, or in a moving position the circular block represented by fig. 2. Having thus described the parts of figs. 1 and 2, as far as is necessary for present reference, I come to explain the action of the apparatus. Fig. 1 represents the block (fig. 2) pressed out to its full extent; and in this situation it must be supposed to have the toe of the crank pin within it, and the screw *d* must be also supposed to have its lower part sunk in one of the darkened holes of the curved groove of fig. 2. Now, by turning this screw, until the end shall be released from this hole, and yet not released from the curved groove, we leave the block, fig. 2, capable of turning nearly the length of the curved groove; and upon turning the block in the direction of the arrow *e*, by means of a rod inserted in one of the holes of its end *c*, it will be forced, by the end of the screw *d*, to pass in a helical direction; and when the other darkened hole of the curved groove comes to be found just under the lower part of the screw *d*; the socket, or cup *b*, of the block, will be found to be within the crank, and the toe of the crank pin to be released. If the screw *d* be now turned until its end is firmly fixed in that darkened hole of the curve which is under it, the block (fig. 2), will be firmly held, and the paddle-wheel will be perfectly disconnected from the engines: a reverse operation will, of course, be necessary to again connect the engines and wheel.

Let us now for a moment imagine that there is a better place for the desired disconnection than at the crank pin; and let this better position be one close to the crank bearing *f*, of fig. 1. Of course, with such a mode, the crank pin would

be firmly and permanently fixed at both head and toe as it ordinarily is. Let that part of the paddle shaft, which is next the bearing *f*, be made thicker than usual; at the end of this thickened part let this part of the shaft terminate; and let there be within this part a circular hole. In this hole it is proposed to insert the inner end of the shaft, which bears the paddle-wheel, in order that this shaft, when the wheel is disconnected, may find in it a temporary bearing. Let there be also two screws, *g* and *h*, passing through the thickened part of the shaft, and entering into the inserted end of the shaft; and let there be a circular sunken groove in the inserted end of the paddle-shaft, having at various distances deepened circular holes to receive the ends of the screws *g* and *h*, whenever they may be pressed into these holes. Let us now suppose the screws *g* and *h* to be housed in two of the deepened holes in the end of the paddle-shaft: in such a case, both wheel and engines will be firmly connected together, and, whenever it may be desirable to disconnect the engines from the wheel, it will be merely necessary to turn the screws *g* and *h*, until their ends be released from the deepened holes of the circular groove; and, when this is effected, the ends of the screws will no longer be in contact with the inserted end of the paddle-shaft, the circular groove allowing the ends of the screws to be within them, and yet not in contact with the inserted paddle-shaft: and this shaft under these circumstances will be perfectly free to move, and be entirely disconnected from the engines There will be no want of stability for the paddle-shaft; because the end of this shaft nearest the crank bearing, will find a steady temporary bearing in the circular hole of the thickened part next the crank bearing. In this plan, there will not even be a necessity for bringing two fitting parts to each other, before a connection or disconnection can be made, as is absolutely necessary in all the plans which have heretofore been proposed; because, by having a number of holes in the inserted end of the paddle-shaft, any two opposite of these holes will answer equally well to receive the ends of the screws; but, after all, to a certain degree it will, and must be necessary to bring parts to each other, which will fit one to the other. With a view to avoid the necessity for this, in some measure difficult operation, when we consider the circumstances under which a connection of the paddle-shaft with the engines has to be made, I have contrived the following plan, which I now describe.

Fig. 3 represents a horizontal view of this plan, with some of the parts removed for the sake of avoiding obscurity; and fig. 4 represents also a vertical sectional view of the same plan. By inspection of fig. 3, it will be seen that in this, as in the plan last described, the crank pin is permanently fixed; and, also, that the paddle-shaft is thicker than usual immediately next the crank bearing *f*; and again, also, that the paddle-shaft has a temporary bearing, when disconnected from the engines, within the hollowed end of the thickened part of the shaft; the inserted end of the paddle-shaft being represented by the dotted lines *l* From the thickened part *g* of the shaft, there protrudes two masses of iron. in form like a short crank arm; one from each side, and, of course, one opposite to the other, these parts being marked *h* and *i*. From the extremities of these arms, and at right angles to them, project two square blocks of iron, represented by *j* and *k*, and having each a hole to receive a screw. Upon the paddle-shaft, at the part *m*, is fixed a disc, with a broad circumference, in form something like a flattened drum. Fig 4, represents most of the parts of fig. 3, and also some of the parts which were left out of that figure; and in both figures similar letters are used to denote similar parts. Of fig. 4, *n* represents a sectional view of the paddle-shaft; *m*, a side view of the disc or drum; *k* and *j* the bent ends of the masses of iron protruding from the thickened part of the shaft; *p p*, two screws inserted in the bent ends *k* and *j*, these screws having circular middle parts, and right and left-handed screws, next to these middle parts, and squared tapering ends at their upper extremities. By *o o*, are denoted two semi-circular broad clutching irons, having at their extremities holes, screwed so as to receive the screws *p p*.

From a view of this figure (fig. 4), it it will be seen that the parts of the paddle-shaft. represented by *m n*, are disconnected from the other parts of this shaft, these other parts being represented by *k j*, *p p*, *o o*. Now, were it desired to connect all the parts of the paddle-

shaft together, it would merely be necessary to turn the screws *p p*, until the irons *o o*, were brought into extremely close contact with the circumference of the disc, or drum *m*; which being done, the engines and wheel would be connected together; and, to disconnect these, it would only be necessary to turn the screws *p p*, in a contrary direction: and the connection and disconnection may be made, in whatever accidental relative position the crank and the paddle-shaft may be found. This plan is the one I originally intended to send you; but it may be considerably simplified, by using only one clutching iron; and, also, by using common screws; which simplifications will be more readily comprehended by an understanding of the next plan, in which, with other changes, these simplifications are made. Some of your readers may readily perceive that this plan is merely a variation of the clutching apparatus, I proposed for the purpose of shifting the paddles of my shifting and reefing paddle-wheel, before described in your pages.

Fig. 5 represents a *doubly enlarged* view of the next plan, at a part similar to that of which fig. 4 is a view of the preceding plan. In this plan (fig. 5), we suppose the paddle-shaft to be thickened close to the crank bearing, and the paddle-shaft to find a temporary bearing in a circular hole in the thickened part of the shaft; and, thus far, this plan resembles the plan of figs. 3 and 4; but in this plan, we have no protruding crank-like arms; but we have, instead, the thickened part of the shaft *semi-circularly* extended, beyond the part *i*, of fig. 1; this semi-circular part being strengthened by two masses of iron, placed on opposite sides of, and longitudinally upon, the thickened part of the shaft. An end view of this semi-circular part is represented by *a*, *b*, *c*, of fig. 5; the ends of the two square masses of iron being marked *a c*. In these ends, *a c*, are two screwed holes made to receive the screws *d d*; to which is attached a semi-circular broad clutching iron, marked *e*, provided at its inner and uppermost part with six prismatic or tri-angular teeth. Thus far, the parts described are parts permanently fixed to the crank; and we now come to describe the part always fixed to the paddle-wheel, of which part, let *f* represent a sectional view. Upon the plain surface of this part of the paddle-shaft, let there be a circular series of broad prismatic, or triangular teeth, of which the ends only are seen in this figure (fig. 5), of which figure a considerate view will show those parts, which are always firmly fixed to the paddle-wheel, to be disconnected from the other parts of the shaft, which are constantly fixed to the crank. In order to connect the two portions of the shaft, it will be necessary to turn the screws *d d*, until the rack on the clutching iron *e*, be brought into close contact with some of the teeth upon the surface of the shaft *f*; which, when effected, the crank and the shaft *f*, and, consequently, the engines and the wheel will be firmly connected together. By this contrivance, it is possible to make the desired connection, at whatever point the wheel and engines may be relatively to each other—in other words, we are not obliged to bring, one constantly same part to another constantly same part, before we can connect the wheel and engines together, as we must do whenever the connection is made by the crank pin: but, on the contrary, wherever we can find teeth on the shaft *f*, to correspond with the teeth on the rack *e*, at such points the connection can be made; and, as we can find these teeth at all points of the shaft *f*, so we can make the connection in whatever situation the shaft *f* may be, as regards the rack *e*; unless we except the barely possible case, in which the apices of the teeth of the rack *e*, shall be found opposite the apices of the teeth on the shaft *f*; in such a case, the turning of the wheel, a hair's breadth either way, will immediately obviate any impediment. It is clear that commonly formed teeth will answer instead of the prismatic or triangular teeth which I have adopted; but I prefer the tri-angular, on account of their acting in the manner of inclined planes, and gradually bringing the shaft *f* into its desired position.

Of all the plans I have now described, I prefer the last; because a connection can be made at any time, by merely turning the screws *d d*, a turn or two, in whatever position the parts to be connected may be relatively to each other, and because the shaft, with the entire apparatus, is scarcely larger than it is under ordinary circumstances, which will at once be evident from an inspection of fig. 5, in which it will be seen that *f*, which represents the paddle-shaft, is but

slightly smaller than the part *a b c*, which represents the size of the disconnecting apparatus. Besides, no great force is necessary to bring the rack *e* into proper contact with the shaft *f*; for, the connection not being necessarily one of friction, any force, which would keep a set of keys, (which the prismatic, or triangular teeth really are in this case,) in position, would be quite sufficient.

In the three last plans which I have described, it will have been perceived, that it is necessary to divide the paddle-shaft into two parts; namely, one part in constant connection with the crank, and the other part in permanent connection with the wheel. This division may, with good reason, be urged as an objection against these three plans; I will, therefore, show how this objection may be removed, and the plans further simplified.

Let us suppose the paddle-crank arm to be firmly and permanently fixed, by the crank pin, to the engine crank arm; and, at that part of the paddle-crank arm which is usually fixed to the paddle-shaft, let us suppose there to be a circular hole, large enough to receive the inner end of the paddle-shaft; in which hole, let the paddle-shaft turn freely, when disconnected from the engine. This shaft, in such a case, will have its inner bearing in its usual place; that is, on the main framing of the engine; and the paddle crank arm will, when disconnected from the wheel, have its bearing on the inner extremity of the paddle-shaft. Suppose the boss of the paddle-crank to be pierced with two screwed holes, to receive screws like *g* and *h* of fig. 1; and suppose the end, of the paddle-shaft, within the hole of the crank, to be grooved in the manner of the same shaft in fig 1; having, in this groove, deepened circular holes as in that figure. Now, in order to connect the crank and paddle-shaft together, it will merely be necessary to turn the paddle-shaft until two of the circular deepened holes, of the groove of this shaft, be found under the screws *g* and *h*, and then to turn the screws *g* and *h* until both crank and shaft be firmly connected together. By turning the screws *g* and *h* in a contrary direction, a disconnection can, in almost a moment be made.

The third plan before described (or that delineated by figs. 3 and 4), admits of a similar further simplification. The blocks of iron, *k* and *j* of these figures, requiring only to be cast upon the boss of the paddle-crank; all the other parts of the plan being placed in a similar manner, in both the originally described and in the now simplified plans. Of course, the end of the paddle-shaft is supposed also to be inserted in a hole in the boss of the paddle-crank.

The fourth plan before described, or that represented by fig. 5, may, in like manner, be simplified and amended, by *semi-circularly* continuing the boss of the paddle-crank, and by placing, upon this semi-circular continuation, the clutching iron and its rack *e*, with the screws *d d*; having upon the paddle-shaft the prismatic teeth of fig. 5, and this shaft, of course, also having its end inserted in a hole in the centre of the boss of the paddle-crank, in which hole it turns freely when disconnected from the crank. Under such circumstances, fig. 5 will represent the new plan equally well with the one originally described; *f*, of course, representing the paddle-shaft in section, and *a b c* the *semi-circular* continuation of the boss of the paddle-crank arm.

And now, Sir, trusting that the foregoing plans will not be found entirely unworthy of a place in your pages, and with much respect,

I beg to subscribe myself, Sir, your most obedient servant,

J. P. HOLEBROOK.

April 17, 1841.
168, Devonshire Place, Edgeware Road.

THE SMOKE NUISANCE.

Sir,—In the 923rd number of your very useful miscellany is an article on the above subject, in which the writer makes some (what I cannot but term rather supercilious) remarks on other writers, who, as he observes, adhere too tenaciously to, and defend unreasonably their own pet schemes. I trust I may escape enrolment in that class, for the little I contribute is in the hope that my endeavours will lead to practical results, and that ultimately the community will benefit thereby.

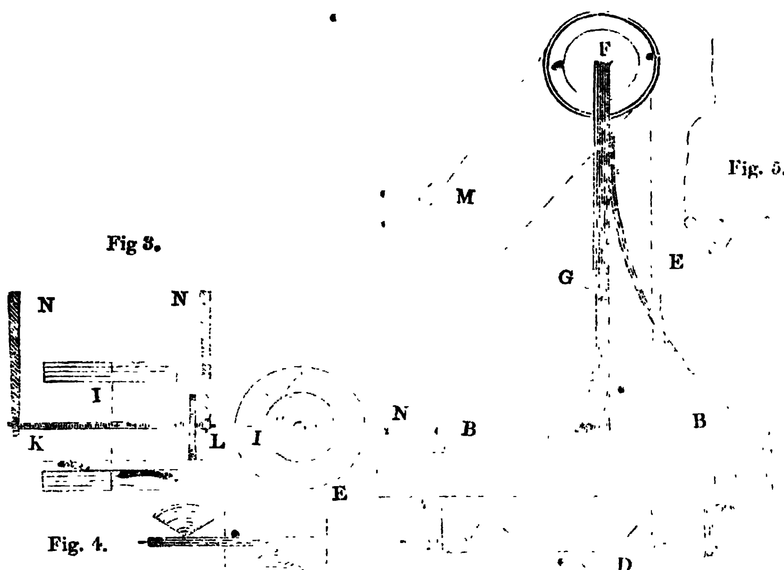
In No. 920 is an article of mine on the improvement in furnaces, which concluded with observing, that when the plan was properly worked out, its advantages would be surprising, as one falling particularly within its influence, is the smoke nuisance, and its cure in the most simple and effectual manner naturally presents itself. The stream of

air driven through the furnace will necessarily carry the smoke in any direction, or to any point to which it may be desirable to convey it, the common sewer for instance, or through a cistern of water, thereby rendering tall chimneys unnecessary, with the enormous cost of which, this simple plan will form a surprising contrast.

S. R.

No. 6, Great Pulteney-street.

THE SCREW AND OTHER PROPELLERS CONTRASTED.



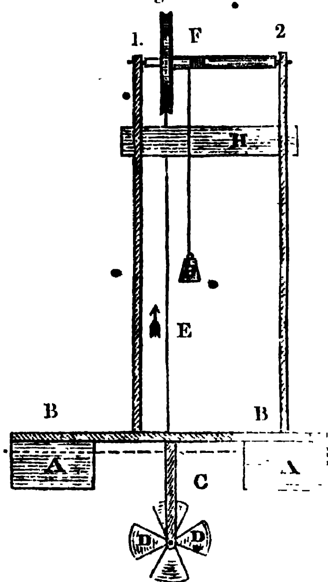
Sir,—Being a constant reader of the *Mechanics' Magazine*, I have read the observations of Mr. Holebrook and others, respecting the properties of Mr. Smith's screw propeller, and having had a touch at a similar plan myself, I have sent you a correct sketch of my model, with a few remarks for publication, if you think them worthy.

Figs. 1 and 2 are side and back elevations, and fig. 3 a top view of the paddle-wheel, (omitted in fig. 2 for distinctness); the same letters of reference apply to each, and the arrows denote the passages of the lines. A A is a twin boat, connected by two cross-pieces, B B; C C are brackets for a screw to revolve between; D is one form of a screw; E its working line; F a wheel and axle, and G the first mover, a four ounce weight, and one ounce suspended by the line E is an exact counter-balance of the weight G; H is an upright frame, for the weight G to have a sufficient quantity of fall; I is a paddle-wheel; K the shaft; L a pulley-wheel instead of a crank; M an endless line; N N stays to paddle. To put the paddle in motion, the wheel and axle F must be shifted from 1 to 2, which will bring the two wheels in a line with each other.

My mode of working the screw, was by winding the line E on the shaft of the screw, until it brought the weight G up to the axle of F; then putting it in a trough of water and letting her go, marking the fall of the weight G, which, of course, denoted the distance the model had made, and taking the exact time the weight was falling. For every form of

screw, and I made a very great variety, I always adopted the same plan, trying

Fig. 2.



each at different angles, and I invariably found that an angle of 45, (otherwise, when they were at right angles with each other,) always had the advantage; the plan shown in the drawing proved the best of all I tried.

After this, the paddle-wheel was fixed, and I soon found that for speed and economy of power, the screw was sadly in the background; and it is very natural when such a difference is found, that I should ascertain the cause, to satisfy myself for my painstaking.

The only loss of power in the common paddle-wheel is the dip and rise of the float-boards; for instance, fig. 1 was attached to a weight full $\frac{3}{4}$ of an oz. by a line passing over a small pulley-wheel, and when in motion, it towed it nearly over the pulley; if instead of working in the water it worked against a solid, half an ounce would have been raised. And why is the screw not able to do this?

Because half the area of the screw acts as a retarder to the weight G, the other half to propel the model; to wit, remove the screw D, and put fig. 4 in its place, the fans of which are placed longitudinal and transversely; the weight would be the same time running down as before, but the model itself would not stir an inch; from which I reckon that half the moving power of the screw is completely lost. Another thing to be considered is, at what point is the mean action of the screw to be taken? For my part I consider it must be taken at the point X in fig. 5; as that part farthest from the axis by revolving quick, would more than balance the other part, providing the blade was hung by a joint at X. The power of lifting by the screw would border nearer upon $\frac{1}{8}$, instead of full $\frac{1}{3}$, as lifted by the paddle-wheel.

Mr. Phillips mentions, at page 409, "That there is practically scarcely any material loss of power arising from the action of the screw." By what I have said, it will be evident our opinions are at variance upon this point.

If one revolution of the screw reaches 4 inches, it does not prove the area of the screw to be forced that distance through the water (see Mr. Phillips's remark, page 410, No. 898), but half the area of the screw may be forced only half the length for each revolution. Again, at page 411, he states, "That the action of the screw is not only direct but constant;" if I understand right, this means the whole power of the engines propels the vessel without loss, barring the slip.

The screw, when immersed, has a direct motion, and a great many indirect motions; to explain this, suppose fig. 2 had a screw fixed on each side, and to dip in the water only as far as the axle, both screws right handed, and to turn the same way. Instead of going direct only, it would make lee way very fast; they might be put crossways, and still act the same, but when completely under water, the points of counteraction are as numerous as the points in the compass. For smoothness of motion, nothing can be more beautiful than the screw, and no matter how rough the water, the pressure is always the same.

I remain, Sir, respectfully, yours,

G. E. B. N.

Whitechapel.

THE SUPERIORITY OF THE CORNISH STEAM-ENGINES.

Sir,—The superiority of the Cornish single-action pumping steam-engines, seems to form the present standing topic of discussion among the scientifically disposed.

The superiority seems to be admitted on all hands; Mr. Parkes observes, indeed, that he considers the fact placed beyond question "that the quantity of action resulting from the steam admitted into the cylinder, is much below the force of the resistance opposed to it and overcome;" and that, "he had for some time conjectured that a hidden and unsuspected cause influenced the performance of the Cornish engine." To find this hidden cause is now, therefore, the object to be accomplished, and no inconsiderable meed of praise will be due to him who discovers this mysterious and subtle agent. Mr. Parkes has been led by the result of his investigations to believe in the existence of the *percussive action* of steam. Other less gifted individuals, but who must have "for every why, a wherefore," in attempting to explain the phenomena of the Cornish engines, have fled to that "refuge for the destitute" of mechanical tyros, "the loss of power in the use of the crank." With this dogma, they at once strike a balance of account between the single and double Cornish engines, with infinite complacency, and having pinned their faith upon the evils of the crank, they stick to their text famously.

The actual merits of the crank are so satisfactorily disposed of in the excellent article recently copied into your pages from the *Encyclopedia Britannica*, that I cannot condescend to occupy your space by any farther attempt to discuss this branch of the question.

I am induced to offer a few remarks on the superiority of the Cornish pumping engines, because I imagine that the real element of their superiority has hitherto been wholly overlooked. There can be no doubt that the extraordinary nursing bestowed upon these engines has produced its full effect in raising the duty; and that in the proportioning and adjusting all the parts, in the manner of supplying fuel, in the expansion of the steam, and in clothing the cylinder, jacket, and boilers, most of the ordinary sources of loss have been guarded against; but it is almost universally held that beyond the economy arising from these sources, some other cause must still be sought, before the actual amount of duty performed by these engines can be satisfactorily accounted for.

Attention seems to be mostly drawn to the piston and condenser, and perhaps naturally, under the impression that in the steam alone is the required explanation to be found.

I am not disposed, however, to seek for the hidden agent in this quarter, and with all due respect I would assert the entire fallacy of the "*percussive*" theory of steam.

It is often said that "truth lies in a well," and I have great reason to believe that in this instance the proverb will be amply verified; by confining myself to the farther end of the beam at any rate I shall not be liable to get into "hot water."

In his paper submitted to the Institution of Civil Engineers, Mr. Parkes states, that the "absolute resistance opposed to the steam, consists of the weight which performs the return stroke, plus the friction of the engine and pit-work, and the elasticity of the uncondensed steam;" to which I beg to add another *trifling item*—the column of water raised in the pump barrel by atmospheric pressure, consequent in lifting the plunger and creating a vacuum therein!

This item of the absolute resistance seems to have altogether escaped the notice of Mr. Parkes, nor has the omission been pointed out by subsequent writers on this question, and yet, I apprehend that the part which this agent occupies in the transaction, is of very considerable moment.

The immense power developed by fluids in motion, was particularly noticed, and first practically applied to useful purposes, by Mongolfier, in his "Hydraulic Ram," the peculiar powers of which have continued to astonish all beholders; and this machine is still employed with immense advantage in places favourably situated for its adoption. Another, but different application of the same property of fluids, formed the subject of a patent recently granted to Mr. Walker, of Crooked-lane, King William-street.

I need not enumerate proofs of the force exerted by fluids in motion (palpably demonstrated when suddenly stopped) as they must be familiar to most persons; but I would just refer to the circumstance of pumps, in some instances, from this cause, delivering a greater quantity of water than is due to the size of the barrel and length of stroke, a paradox in many respects similar to that of the Cornish engines.

The water-load in the Huel Towan engine was very accurately ascertained to be 11 lbs. per square inch on the piston, and Mr. Parkes treats this as a *uniform load throughout the stroke*—which it cannot possibly be. When the steam is first admitted to the cylinder, and the piston begins to move, lifting the plunger, the *vis inertiæ* of a perpendicular column of water has to be overcome, and this is effectually accomplished by the excess of the steam pressure; but fluids once set in motion acquire a degree of momentum in many cases surpassing belief, and as the steam pressure is slowly diminished, this momentum of the water comes in aid of its decreasing powers, and the mass of solids *and fluid* in motion, acts the part of a fly-wheel, which having absorbed the excess of the initial power over the resistance, discharges it by degrees until the stroke is completed, when the whole is brought quietly and steadily to a state of rest.

The error appears to me to be in treating the water-load as a uniform quantity. Had its real effects been as accurately noticed as those of steam, I believe it would be found that the great economy of the Cornish engines depends in no small degree upon their speed having been so regulated as to use up, and convert into an economising agent, the whole of the momentum generated; and that calculations made upon this data would show that a perfect equilibrium of the power employed, and work performed, takes place in the Cornish pumping, as well as in every other class of steam-engines.

Without trespassing further on your pages, allow me to remain,

Yours, respectfully,

WM. BADDELEY.

29, Alfred-street, River-terrace, City-road, April 22, 1841.

ON THE APPLICATION AND USE OF AUXILIARY STEAM POWER, FOR THE PURPOSE OF SHORTENING THE TIME OCCUPIED BY SAILING SHIPS UPON DISTANT VOYAGES.—BY SAMUEL SEAWARD, ESQ., M. INST. C. E.

[Abstract of a Paper read before the Institution of Civil Engineers. From Official Minutes of the Transactions of the Institution.]

But few years have elapsed since the possibility of propelling vessels by the power of steam was treated as a chimera; and although the practicability of its application for short voyages has been successfully demonstrated, by the numerous vessels plying between this country and the Continent, it is but of very recent date that its employment for long sea voyages has been adopted. The weight of the powerful machinery and the fuel, and the consequent loss of space for cargo, together with many other circumstances attendant on the present construction of steam vessels, induced the author (who received the education of a seaman, and has since had extensive practice as an engineer) to believe that a more efficient mode of employing steam power for long sea voyages might be adopted.

Notwithstanding the great improvements which have taken place in the construction of steam-vessels, and their machinery, it would appear that the duration of the voyage ought not to exceed twenty days, after which time a fresh supply of fuel becomes necessary: hence, steam has rarely been adopted for very long voyages. The reason of this limit to the duration of the voyage of a steam-vessel, as at present equipped, is that an increase of power does not produce a corresponding increase of speed, while the weight of the machinery increases in proportion to the power employed, and in some cases exceeds it; for instance, small engines, with the water in the boilers, generally weigh about one ton per horse power, while in some large engines the ratio is nearly 25 cwt. per horse power.

A quadruple increase of power will not produce double the original velocity in a steam-ship, although, in theory, such is assumed to be the case; for as the weight is more than doubled, the immersed sectional area becomes greater, and a still further increase of power is necessary. It has been shown by experience, that if a vessel with a given power is propelled through the water at the rate of eight miles per hour, her speed cannot be doubled, even though the power be multiplied twelve times, and the entire hold of the vessel occupied as an engine-room.

The weight of fuel is also in direct proportion to the size of the engines; so that taking, for example, two vessels of 200 and of 400 horses power respectively—that of the higher power will have to carry nearly double the weight both of fuel and of engines, and it is still questionable whether the increased force will propel the one ship more than 1½ mile per hour faster than the other.

The space occupied by the engines and fuel in the most valuable part of the ship, is also an important consideration: neither the *President* nor *British Queen* steamer, although of 2000 tons measurement, is capable of carrying more than 500 tons of cargo when the fuel is on board.

The author then examines the question of employing too much power in a steam-vessel, and refers to the *Liverpool* as an instance

that such may be the fact. It appears that with the original dimensions of 30 feet 10 inches beam, and engine power of 450 horses, being a proportion of power to tonnage of about 1 to 2¼, the vessel was immersed 4 feet beyond the calculated water line, and a decided failure was the natural consequence; but when the breadth of beam was increased to 37 feet, augmenting the capacity 400 tons, and giving the proportion of one horse power to 3¾ tons burthen, the performance of the engine and the speed of the vessel were both materially improved.

The *Gem*, Gravesend steamer, 145 feet long, by 19 feet beam, had two engines of 50 horses power each; the speed was insufficient, being only 12½ miles through the water; but when the same engines were placed in the *Ruby*, which was 150 feet long, and 19 feet 9 inches beam, the velocity of the latter vessel was 13¼ miles per hour. A pair of engines of 45 horses power each were then placed in the *Gem*, without altering the vessel, and in consequence of the diminished weight and draught of water, her speed then nearly equalled that of the *Ruby*.

The author does not condemn the application of considerable power for vessels, provided it can be employed without materially increasing the weight and the area of the immersed midship section. It appears that the length of a steam voyage, to be profitable, is at present limited to 20 days for the largest class of steamers; that we have about 30 others which can approach 12 days, while the majority cannot employ steam beyond 8 days successively, without a fresh supply of fuel. It is evident, therefore, that more efficient means must be adopted for the general wants of commerce in our extended intercourse with the East and West Indies, the Pacific, Mexico, Brazil, Australia, and all the distant colonies, which now demand rapid communication with England.

The author refers to a pamphlet, published by him in 1827, entitled, "Observations on the possibility of successfully employing Steam Power in navigating Ships between this country and the East Indies, by the Cape of Good Hope." He therein proposed that large square-rigged ships, of 1500 to 1800 tons measurement, should be fully equipped and constructed, so as to sail 10 or 11 miles per hour with a fair wind; that they should carry engines of small power, to assist the sails in light winds, propel them at a moderate speed during calms, work into and out of harbour, &c., and thus shorten those portions of the voyages wherein so much time was usually lost.

To all well-built good-sailing vessels of 400 tons and upwards, "auxiliary steam" is applicable. A steam-engine of the necessary power can, without inconvenience, be placed in such vessels, either on or between decks, so as to propel a ship at the rate of 4 or 5 nautical miles per hour in a calm, and for this speed a proportion of one horse power to 25 tons is amply sufficient. The practicability of applying this system to East Indiamen and other similar vessels is then examined at length, and it is shown that the ordinary speed of these ships under sail is, before the wind, 11 to 12 miles per hour, and in a gale 13 to 14 miles per hour, which is greater by two or three miles per hour than that of any ordinary steam-vessel when under sail, on account of the latter being impeded by the wheels trailing in the water, and the slightness of their masts, spars, and rigging. The auxiliary steam power might, therefore, be efficiently applied, either by using it alone, or in conjunction with the sails, so as to keep up a uniform speed, by which a great saving of time could be effected in a long voyage.

The conditions of sailing and steaming voyages to India, with the influence of the trade-winds, are then examined, and the author proceeds to detail the experiments made by him on board the *Vernon*, Indiaman, which was the first sailing vessel that actually made a voyage out and home with "auxiliary steam."

The *Vernon*, built in 1839, by the owner, Mr. Green, was 1000 tons burthen; the sailing speed was about 12 to 13 miles per hour in a fresh gale, and being from her frigate build well calculated for the experiment, it was determined to equip her with a condensing engine of 30 horses power, placed midships on the main deck, between the fore and main hatchways; the space occupied being 24 feet long by 10 wide. The weight of the machinery was 25 tons, and it was so arranged that the motion was communicated direct from the piston cross-head by two side rods to the crank on the paddle-shaft, placed immediately behind the lower end of the steam cylinder, which was horizontal. The wheels were 14 feet diameter, projecting 5 feet, and were so constructed that the float boards could be raised to suit the draught of water of the ship; or they could be taken entirely away, if necessary, leaving the shafts projecting only 18 inches beyond the sides. Under ordinary circumstances they were disconnected from the engine by a simple contrivance, consisting of a moveable head, attached to the crank on the paddle-shaft, by turning which, one quarter of a circle, the crank pin was liberated, and the wheels turned freely round. The *Vernon*, thus equipped, having on board nine hundred tons of cargo, and sixty tons of coal, drew 17 feet of water. In the first trial the speed of the vessel, under steam alone, was five and three-quarters nautical miles per hour, demonstrating how small a power is necessary for a moderate speed. She then started for Calcutta, and

though the piston-rod broke three times during the voyage, owing to a defect in one of the paddle shaft bearings, the passage was satisfactory. The details are given minutely, as are also those of the homeward voyage, which was performed from Calcutta to London in eighty-eight days, to which must be added seven days for necessary delay at the Cape, making a total of ninety-five days, which is the shortest passage on record. Great credit is given to Captain Denny for the jugdment with which he used the auxiliary steam power, and the course taken by him, by which he was enabled to overcome the difficulties incidental to a first trial of so important a system. The success of the *Vernon*, induced the immediate application of engine power to the *Earl Hardwicke* Indiaman, and both these vessels are now on their voyage out to Calcutta.

This communication was accompanied by drawings of the *Vernon* and the *Earl Hardwicke*, and by a chart, on which was laid down the proposed daily course of a steam ship, on a voyage to and from Calcutta, showing where sails only were necessary, then where steam alone, and also when the joint agency of steam and wind would be required. Also, the daily progress of the *Marquis of Huntly* Indiaman, of fourteen hundred tons burthen, on a voyage to India and China, and home, from the author's own observation, in the year 1816.

For the purpose of demonstrating the ratio of power to velocity, a Table was also given showing the velocities of ships of different tonnage, having steam power of various ratios, deduced from upwards of one hundred experiments on large steam vessels. The mode of disengaging the cranks was illustrated by models showing the gradation, from the complication of the first idea, to the beautiful simplicity of the present plan, which is now employed on board of the Government war steamers.

Mr. S. Seaward explained the Table of Velocities of steam ships, which accompanied his paper.

The top line of figures represents the number of horses power, ranging from thirty to three hundred. The side line gives the tonnage of the steam ships, rising progressively from one hundred to twelve hundred tons. The intermediate spaces show the number of knots or nautical miles, which a ship of given tonnage, with a certain power, will travel through still water per hour.

The tonnage is calculated by the old rule (13 George III. cap. 74): "From the length substract $\frac{3}{5}$ths of the breadth, multiply that sum by the extreme breadth in the widest part, and again by $\frac{1}{2}$ the breadth, divide the product by 94, and the quotient will be the true tonnage."

The Table is constructed upon the principle, that each vessel of a good modern form will carry, at a proper draught, a weight equal to her measurement tonnage, and is presumed to be loaded equal to her tonnage, either by the weight of her engines, fuel, or cargo, and it terminates at thirteen knots, at which speed the engines alone become the full load of the ship. The mode of constructing and of using the table was fully described, and examples were given.

It was shown, that an engine of thirty horses power would propel a ship of twelve hundred tons burthen, at the rate of 4 knots per hour, while three hundred horses power would only propel the same ship at the rate of $10\frac{3}{4}$ knots per hour. Hence, ten times the power would only produce about two and a half times the speed. The principal points in the paper were more fully dwelt upon, and in answer to questions from some of the members, Mr. Seaward remarked, that no steamer in England had ever been propelled at more than fifteen geographical miles per hour, through still water.

In some of the Government mail packets the engines and coals were the full cargo of the vessel. The Table did not apply to vessels overladen with power, for as the weight increased in the ratio of the power, so the immersed sectional area was augmented, and the lines of the vessel which might be well calculated for speed when at a proper draught, became lines of retardation, and the engines did not work up to their proper speed, owing to the depth to which the paddle floats were immersed. For instance:—The wheels of the *British Queen* have been plunged between 6 and 7 feet, instead of 4 feet, which was the calculated dip; the engines at the same time diminishing their speed so much as to reduce the effective power from five hundred horses to nearly three hundred horses.

The only advantageous way in which great power could be applied, would be by contriving to prevent the increase in the weight of the machinery and fuel, and those engineers would be most successful who could so apply the materials of construction, as to ensure strength without the usual corresponding increase of weight.

Mr. George Mills, from his experience as a ship-builder, at Glasgow, was enabled to confirm all that Mr. Seaward had advanced. On the Clyde, the employment of an excess of power in steam vessels had been carried to the greatest extent, without producing corresponding advantages, either for speed, or in a commercial point of view. It would appear that the same error had to a certain degree been committed on the Thames, but less than on the Clyde; for on the latter river there were vessels with nearly double the power, in proportion to size, as compared with any vessel on the former river.

He believed that on the Thames no vessels had so much as one horse power for each register ton, whereas on the Clyde, there were steamers of seventy to eighty tons register, having single engines, with cylinders of 54 inches diameter, which was more than one hundred horses power. It would appear that this application of extra power had only obtained a very moderate speed, while the great first outlay, with the commensurate current expenses, had reduced the commercial profit to the lowest point,—of this the proprietors alone could give any account; but as to the speed attained, he had seen three steamers of identical tonnage leave the Broomielaw at the same time, their engines being respectively of one hundred and ten, eighty, and sixty horses power; yet their speed was in the inverse ratio of their power: the vessel with the smallest engine arrived at Greenock first, the greater power second, and the greatest last. These remarks were only applicable to river boats. With regard to sea-going vessels, the system had not been carried to so serious an extent, yet with them the average proportion was about one horse power to two register tons, and some few reached as high as one horse to one and one-eighth of a ton.

As an example of an augmentation of power producing an opposite result from that which was intended, Mr. Mills mentioned two vessels called the *Tartar* and the *Rover*, built by him and his (then) partner, Mr. Charles Wood. They were each of about two hundred and twenty tons register, built from the same draught, and in every respect as similar as possible—except that the engines, which were by the same maker, were respectively of one hundred and seventy, and one hundred and thirty horses power; yet whenever they worked together, the one with the smaller power proved herself the faster vessel, either in a calm, with the wind, or even against it. The *Achilles*, Liverpool steamer, which lately had an addition of 30 feet to her length, and 18 inches to her breadth, augmenting the tonnage about one-fifth, had improved her speed upwards of one mile per hour, although she carried a much heavier cargo than before.

He had built a vessel of five hundred and sixty tons register, with engines of one hundred and thirty horses power on board—a proportion of power to tonnage of one to four; the stowage for cargo was ample; the accommodations for passengers excellent. She drew little water, and her speed was much greater than vessels of double her power. Yet in spite of all this, the vessel could not find a purchaser, because the power was not nominally large.

It would be asked—why, with these and so many similar instances, such a system was continued? It was not likely that the engineers would complain of having orders for large engines; and there were certain dimensions prescribed for the vessel, to which the ship-builder was under the necessity of conforming.

The chief cause of mischief, however, was the fiat of the public. It was believed that a great power would remedy want of speed and all other evils, and it was found indispensable for ensuring the confidence of travellers. Hence, the shipowners, who depend upon the public for support, were obliged, against the conviction of their experience, to keep up the errors occasioned by ignorance.

The President observed, that the condemnation of large power should not be carried too far, as experience alone had produced the increase of weight, strength, and power, of the present engines, compared with those of the early steamers which were built, instancing the Halifax Packets (Cunard's), which, with their great power in proportion to tonnage, had performed their duties satisfactorily.

Mr. Mills explained that the Halifax Packets were built for the special purpose of carrying the mails only, to perform the voyage in a given time,—about twelve days. The engines were built by Mr. Robert Napier, after the model of those of the *Great Western*, which used their steam expansively; similar provisions had been made in the Halifax Packets, but the expansion valves were seldom used.

Mr. Field agreed with the principal part of Mr. Seaward's paper, but he would prevent an erroneous conception of the term *overpowering* a steamer. A vessel could not have too much power, provided that power could be advantageously applied, without causing too deep an immersion. A good result could be produced only by keeping a proper proportion between the machinery, the vessel, and the paddle wheels, and immersing the hull of the steamer only as deep as the true lines of draught.

Mr. Vignoles observed, that in this country the reputation of engineers depended upon the commercial success of the works they engaged in. An erroneous public opinion might have influence at present; but if the engineer and ship-builder would determine to break these trammels, and produce such vessels as should force conviction upon the public mind by the speed attained, and show the proprietors the consequent commercial advantage, the present system would soon be abandoned.

Mr. Parkes eulogized Mr. Seaward's candour in describing the errors in the first construction of the engine on board the *Vernon*; more was frequently to be learned from failures than from successful efforts, and no communications to the Institution would be so useful as those which gave accounts of defective design or construction, with the

details of the methods adopted for remedying the defects. He directed attention to the performances of the *Great Western* steam ship, which at least equalled those of the Halifax Packets, without the disadvantages of being unable to carry cargo, or of shipping so much sea, when the weather was foul. The important feature of economy of fuel on board the *Great Western* might be in part attributed to the use of steam expansively. It was very desirable that the institution should possess very full drawings and a description of the *Great Western*, so as to be enabled to compare them with those of the Halifax Packets, which had been promised by Mr. George Mills. He would impress upon manufacturers of marine engines the necessity of adopting a correct and uniform nomenclature of the power placed on board steam vessels. The nominal selling power did not accord with any calculation.

Mr. Field believed the Table of Velocities calculated by Mr. Seaward to be very nearly accurate. The speed of the *Great Western*, when loaded to her proper draught, had been as high as $13\frac{8}{10}$th miles through still water. There was an error in the alleged speed of Cunard's vessels; they reached Halifax in ten days; Boston in three days more, and then had still one day's voyage to New York. The average duration of the voyages of the *Great Western*, was about fourteen days and a half. If two hundred tons were deducted from the tonnage of the *Great Western* for cargo and the accommodation for the passengers, she would then be similar to the Halifax Packets. The engines of the *Great Western* were nominally estimated at four hundred horses power, and the average consumption of fuel was twenty-six tons every twenty-four hours.

TABLE showing the power required to obtain various rates of speed in a Steam Vessel, where the total weight of cargo and engines remains in all cases the same, and in which, with a power of 30 horses, a speed of 5 miles per hour is obtained; the total weight carried being in all cases 1000 tons, and the engines weighing 1 ton per horse power.

Weight of Cargo.	Weight and Power in Tons and Horse Power.	Relative speed.	Speed in Miles per hour.
970	30	$5\sqrt[3]{1}$	5·
940	60	$5\sqrt[3]{2}$	6·299
910	90	$5\sqrt[3]{3}$	7·211
880	120	$5\sqrt[3]{4}$	7·937
850	150	$5\sqrt[3]{5}$	8·549
820	180	$5\sqrt[3]{6}$	9·085
790	210	$5\sqrt[3]{7}$	9·564
760	240	$5\sqrt[3]{8}$	10·
730	270	$5\sqrt[3]{9}$	10·4
700	300	$5\sqrt[3]{10}$	10·772
670	330	$5\sqrt[3]{11}$	11·119
640	360	$5\sqrt[3]{12}$	11·487
610	390	$5\sqrt[3]{13}$	11·756
580	420	$5\sqrt[3]{14}$	12·050
550	450	$5\sqrt[3]{15}$	12·331
520	480	$5\sqrt[3]{16}$	12·599
490	510	$5\sqrt[3]{17}$	12·856
460	540	$5\sqrt[3]{18}$	13·103
430	570	$5\sqrt[3]{19}$	13·34
400	600	$5\sqrt[3]{20}$	13·572
370	630	$5\sqrt[3]{21}$	13·794
340	660	$5\sqrt[3]{22}$	14·01
310	690	$5\sqrt[3]{23}$	14·219
280	720	$5\sqrt[3]{24}$	14·422
250	750	$5\sqrt[3]{25}$	14·62
220	780	$5\sqrt[3]{26}$	14·812
190	810	$5\sqrt[3]{27}$	15·
160	840	$5\sqrt[3]{28}$	15·182
130	870	$5\sqrt[3]{29}$	15·3615
100	900	$5\sqrt[3]{30}$	15·535
70	930	$5\sqrt[3]{31}$	15·706
40	960	$5\sqrt[3]{32}$	15·854
10	990	$5\sqrt[3]{33}$	16·037

During the discussion, Mr. Cubitt had calculated the following Table, showing the rates of velocity which would be attained by substituting engine power, with its consequent weight of one ton per horse power, for cargo, so as to preserve the draught of water the same in all cases.

Mr. Seaward remarked, that his Table of power and Velocities was corroborated by Mr. Cubitt's—the practical results verified both. The great difference between the *Great Western* and the Halifax Packets consisted in the better adaptation of weight and power to tonnage, and the more economical consumption of fuel of the former over the latter—the one carrying cargo and passengers, the other only the engines and fuel, yet the *Great Western* travelled farther with the same quantity of fuel.

In answer to a question relative to American steam boats, he believed that the build of the river steamers was very peculiar: some of them had engines of six hundred horses power on board, yet they drew only 4 feet of water, whereas a sea-going steamer with that power would draw at least 16 feet. As far as he could ascertain, the actual well-authenticated speed did not exceed fourteen and a half geographical miles per hour through still water. The fuel consumed could not be ascertained, as it was chiefly wood, taken on board at the places of stoppage; there was a great consumption of steam at a very high pressure. Their machinery was not heavy, and was especially adapted to the vessels. Daily improvements were making in the form of vessels in England, and when high pressure steam and light engines were applied to vessels of a different form from those at present constructed, the speed must be increased. Some vessels were now building on the Thames of an extremely light construction, with tubular boilers, and the weight of the machinery would be only eleven cwt. per horse power.



ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

CHARLES PARKER, OF DARLINGTON, FLAX-SPINNER, *for improvements in looms for weaving linen and other fabrics, to be worked by hand, steam, water, or any other motive power.* Enrolment Office, April 22, 1841.

These improvements, which are fourfold, relate to power looms. The first is in the mode of giving off the warp, which is effected by the following arrangement:—Two revolving rollers and an intermediate one are placed at the lower part of the back of the loom; the former are covered with woollen cloth, and one of them being connected with the main shaft of the loom drives the other through the medium of toothed gearing and a small pinion fixed between them, causing them both to revolve in the same direction. The warp threads are passed round these rollers, thence over a roller at the top of the loom, and are then fastened to the cloth beam; by which means the warp threads are given off in a more steady and uniform manner than usual.

Secondly. For taking up the work, a worm wheel is fastened on one end of the cloth-beam, which is driven by a worm on one end of a horizontal shaft, extending towards the back of the loom, and having at the other end two cog-wheels turning loosely on the shaft; alongside of each cog-wheel a ratchet-wheel is fixed to the shaft, being turned by a click from the cog-wheel when turned in one direction, but when turned in the opposite direction, the inclined rachets permit the click to slide over them. The cog wheels are turned by means of racks in two vertical rods suspended by pin-joints from horizontal levers at the top of the loom; the lower ends of the rods are forked, the forks receiving between them a stud on the sides of two cams, which causes them to rise or fall alternately. The falling of one rod turns the horizontal shaft half way round, it then rises, the descent of the other completes the revolution, thus giving a continuous rotary motion to the horizontal shaft and work beam. The two horizontal levers at the top of the loom are hollow, and have each a slot in their under side throughout their length; a screw is placed within, to which a slow rotary motion is given, and suspended from this screw is a weight which passes through the slot and hangs below the lever; by the rotation of the screw this weight traverses from the axis to the extreme end of the lever, which gives a continually increasing leverage for winding up the cloth beam as it gradually increases in size.

The third improvement is an ingenious contrivance for stopping the loom whenever the weft thread breaks or is expended; for this purpose the weft thread passes first from the bobbin through a ring in the shuttle, and then through a hole in the end of a horizontal spring-lever which has a constant tendency to protrude through the side of the shuttle, but is kept back by the tension of the weft thread as long as it remains whole; but the moment it breaks or fails, the lever being set free projects through the side of the shuttle, and on entering the shuttle-box liberates a

spring-lever which causes a forked rod to shift the driving band from the fast to the loose pulley, and thus stops the loom.

Lastly, the following arrangement is described for changing the shuttles in the event of a thread breaking or being used up:—the shuttle-box is composed of a drawer with two cells, one of which contains a spare shuttle ready charged; this drawer is constantly pulled in one direction, but is prevented from moving by a spring stop; on the working shuttle entering its cell with the thread broken or expended, the horizontal lever which projects through the side of the shuttle strikes against one end of a short lever, the other end of which draws back the spring and releases the drawer, which is immediately pulled forward, the charged shuttle taking the place of that which has been rendered *hors de combat*.

The claim is, 1. To the mode of combining three rollers for giving off the warp in looms.

2. To the mode of taking up the work or fabric by self-adjusting weights and levers.

3. To the mode of stopping a loom by means of apparatus applied to a shuttle and shuttle-box.

4. To the mode of changing the shuttle by means of the apparatus herein described.

Thomas Clark, of Wolverhampton, Iron Founder, *for certain improvements in the construction of locks, latches, and such like fastenings; applicable for securing doors, gates, window-shutters, and such like purposes.* Enrolment Office, April 22, 1841.

This invention consists in the employment of weighty or weighted levers instead of springs, to preserve the proper position of the bolts when locked or unlocked. In the lock described, one tumbler only is employed, but any number may be used, or none, according to the degree of security to be provided. The tumbler turns on an axis behind the key-hole of the lock, on which a weight or weighted lever also turns, the other end extending towards the front of the lock and having two studs, one on its upper part, another on its centre. The bolt has two notches on its upper edge, one longer than the other, and divided by a small projection; there are also two openings in the middle of the bolt communicating with each other by a slot. The lowest stud on the weighted lever takes into these openings, while the upper stud takes into the top notches, both the studs being in the notches, and openings towards the front of the lock when it is unlocked. On inserting the key and turning it half round, it raises the tumbler and weighted lever, allowing the studs to pass the projections as in the usual Barron locks. The latch-bolt is fastened to the lighter end of a weighted lever, suspended from a suitable axis at the upper part of the lock; on turning the handle, two small levers lift the heavy end of the lever, and draw back the lighter end of the latch-bolt which is fastened to it.

The claim is to the substitution of weights or weighted levers for springs, in the construction of locks, latches and other fastenings, in the manner herein described.

Richard Edmunds, of Banbury, Oxford, Gentleman, *for certain improvements in machines or apparatus for preparing and drilling land, and for depositing seeds and manure therein.* Petty Bag Office, April 22, 1841.

The machine for preparing land consists of a horizontal bar, extending across it, and carrying the two running wheels; along this bar a number of forked levers are hinged, the lower ends of which carry the angular-edged pressing rollers; each of the levers is also furnished with a scraper for removing the earth from the rollers. By means of this construction the rollers accommodate themselves to the inequalities of the ground, independently of each other. These rollers may be weighted as required, and form a series of angular grooves or furrows in the ground, for the reception of seeds, manure, &c.

In order simultaneously to regulate the escape of seed from all the apertures in drilling machines, the lower part of the hopper is pierced with a number of holes for the passage of the seeds, and in front of these apertures a long plate slides in grooves, having a corresponding number of openings in it; by shifting this bar backward or forward, the apertures are enlarged or contracted, and the escape of the seeds increased or diminished.

In order to propel and guide hand drilling machines, two rods are employed, one being attached at one end to the machine just behind the wheels at right angles to the axle, and the other is attached at one end to the machine, and at the other end to the first rod at an angle of 45°. By this arrangement, the workman who guides and propels the drill by means of a handle attached to the end of the first rod, has only to keep the wheel that is before him in the furrow.

The following improved construction of drilling machine is next described:—The hopper is pierced with a number of holes, through which the seeds are received on a notched wheel; by this wheel it is gradually poured through funnels into the angular grooves in the ground formed by the angular rollers first described. The supply is regulated by a sliding plate, in the manner already described.

The claim is, 1. To a machine for pressing and preparing land for sowing corn, grain, seeds, or manure, in which a number of

pressing rollers are employed, each roller being mounted on a separate axle, so that they may yield to any inequality in the surface of the ground.

2. To the use of a long bar or plate for the purpose of simultaneously regulating the escape of grain in drilling machines, from all the apertures, and the mode of propelling and guiding the machines.

3. To the improved construction of drilling machines herein described, and the manner of regulating the supply of grain through all the apertures simultaneously.

RECENT AMERICAN PATENTS.

[From Dr. Jones's List in the Journal of the Franklin Institute, for January, 1841.]

FOR COUPLING TWO OR MORE PLOUGHS, TO BE WORKED BY ONE TEAM; *Joseph Card, Painsville, and Grandison Newell, Mentor, Geauga county, Ohio, November* 9.—"The nature of our invention consists in attaching to the draught end of the plough beam, a coupling case of such length as is desired, according to the number of ploughs to be worked at once, and so constructed as that each plough shall run truly, steadily, and at any given distance from its fellow."

The claim is to "the mode of drawing one, and of coupling two or more ploughs together, by means of the case, stirrups, and bolts, as described."

FOR MACHINERY FOR MANUFACTURING LONG CORDAGE; *William E. Meginnis, city of Philadelphia, November* 9.—"The nature of my invention consists in a machine for manufacturing cordage by confining the strand, or rope, firmly in the end of the horizontal spindle that imparts the twist, and after twisting the rope, or a component part thereof, the length of the rope walk, the rope is loosened at the outer end of the spindle, and the operation of twisting is repeated. By this arrangement, ropes of great length, many times the length of the rope walk, can be manufactured, and thus avoid splicing."

The claim is to "the making the head of the spindle in two parts, which can be separated for the purpose of putting in and taking out the rope, &c., or scarped out for the same purpose, as described."

FOR A STRAW CUTTER; *William A. Staples, Lynchburg, Campbell county, Virginia, November* 16.—In this machine there are two knives, or cutters, placed upon the end of a horizontal shaft, which is made to revolve alongside the feeding trough containing the straw. These knives revolve between double rims or circular plates of metal which are sustained at a sufficient distance apart for that purpose. The claim is to "the employment of the double rims, between which the ends of the knife, or knives, are received and revolve, said rims being furnished with cross-bars, which operate as stationary, or bed shears, sustaining the straw on each side as it is cut by the knife."

FOR MACHINERY FOR BORING THE POSTS AND TENONING THE RAILS FOR FENCES; *William H. Shay, city of New York, November* 25.—"For boring the posts I use two or more augers placed side by side, and geared together so that by communicating motion to one of them the whole will be made to revolve. The parts to be bored are held by means of what I denominate calliper leaves, which are sustained upon a sliding carriage upon which the post can be fed up to the augers. The tenoning apparatus consists of cutters placed upon a revolving wheel, which I denominate the rotary cutter, or tenoning wheel. Said wheel having a double rim, each of which is furnished with a cutter, or cutters, that sharpen, or tenon, the rails, reducing them all to the same thickness at the ends."

The claim made is to "the combination and employment in such a machine, of the calliper leaves for holding the posts whilst they are being bored; by means of which the range of mortices will all be in a direct line, and through the middle of the stuff, notwithstanding any twist, or other irregularity, which there may be in it."

NOTES AND NOTICES.

Composition for Roofs.—Sir,—The following composition was employed for the roof of a mill at Wickham, Hants, twenty years ago, and is now as good as ever; the roof is flat, having a run of one inch to the foot from the centre, of thin boards, to which was nailed one course of common sheathing paper. To eight gallons of common tar was added three gallons of roman cement, five pounds of resin, and three pounds of tallow; these ingredients were boiled and well stirred so as thoroughly to incorporate them, and payed on to the roof hot with a brush, spreading it as evenly as possible. Before it got cold it was sprinkled with sifted sand. When the first coat was cold, a second was applied, and sanded as before. A single coat of common, or coal tar, about once in five or six years, is sufficient to preserve it indefinitely. I am, Sir, your obedient servant, A SUBSCRIBER.

Putting Arches into Old Walls.—Sir,—Your correspondent, Mr. John Combes,* architect, whose communication appears in No. 920, is perhaps not aware that the mode he describes of putting arches into old walls, has occasionally been made use of by others; and one instance, to which he and your readers may be referred, is in the front of the brewhouse, in Earl-street, Seven-dials; an arch there so inserted was made in the year 1825. I am, Sir, yours, obediently, A SUBSCRIBER.

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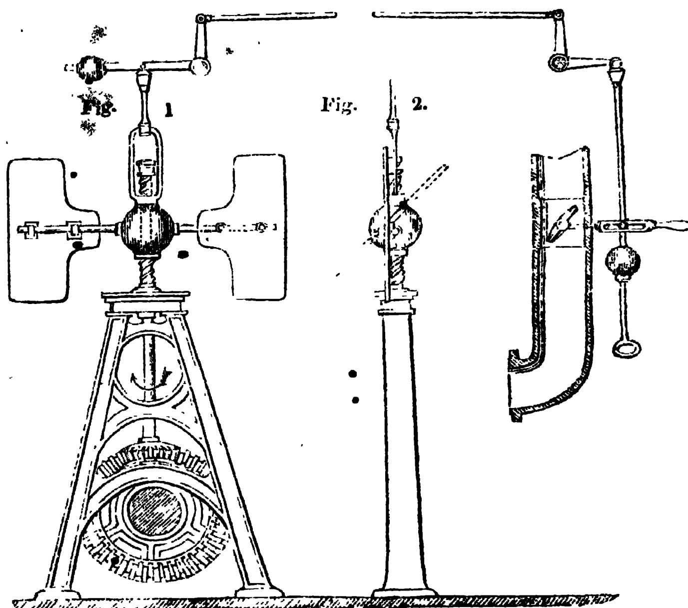
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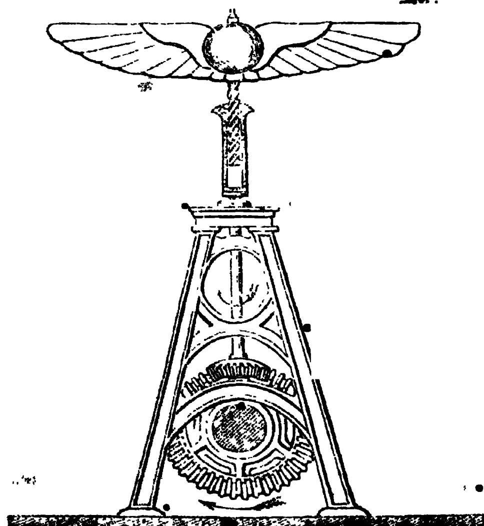
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 927.] SATURDAY, MAY 15, 1841. [Price 3d.

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HICK'S PATENT GOVERNOR FOR STEAM-ENGINES AND WATER WHEELS.





IMPROVED GOVERNOR FOR STEAM ENGINES, WATER WHEELS, AND OTHER MACHINERY. BY MR. BENJAMIN HICK, JUN.

The object and advantages to be attained by the "Improved Governor" will be most easily understood by a brief reference to the principle and construction of the one at present in general use.

The principle of the ordinary Governor is that of a double pendulum, in which the period of revolution is determined by the length of the pendulum, on the vertical height to the point of suspension, from the plane in which the balls revolve. When the speed of the engine is increased beyond its ordinary rate, the governor partakes of that increase, and the balls fly out farther by their centrifugal force, and in so doing diminish the supply of steam to the engine; the reverse is the case when the speed of the engine is reduced, and the governor balls collapsing open the throttle valve wider.

This mode of action is found to be practically imperfect in regulating the admission of steam to engines under different amounts of load? in as much as with every change of load, the balls must revolve in a different plane, requiring a speed corresponding to the difference in the vertical length of the pendulum.

Mr. Farey, in his "History of the Steam Engine" fully illustrates this action, where he says—"a different quantity of steam will be required for every permanent change of resistance, but the governor can make no change in the opening of the throttle valve, except in consequence of a change of velocity in the engine, and that ought to be avoided by adjusting the connection between the governor and the throttle valve, according to every permanent change of resistance.

So that, although the present governor serves to correct trifling fluctuations of load, it is found practically necessary to regulate the supply of steam by an alteration in the length of the rods which connect the governor to the throttle valve, whenever a permanent increase or decrease of work takes place, and to this defect in principle is attributable also the oscillating or irregular motion of the governor before any variation in speed is corrected.

Serious objections attend the application of the present governor in the regulation of large engines employed for the purposes of spinning, weaving, &c. In such cases it is usual to adjust the speed and position of the governor at the period when the engine is driving its whole work when the throttle valve requires to be nearly wide open; but, owing to the *limited space* through which the present governor can be made to move, it is incapable of closing the throttle valve entirely, even when the balls have been expanded by a greatly increased speed to their utmost extent, consequently an engine being suddenly relieved from its load is altogether uncontrolled by the governor, and proceeds to revolve or run away at an increased and increasing velocity, thereby producing in many instances serious effects.

The "Improved Governor" entirely obviates these defects, being capable of regulating the speed of an engine under any variation of load, and it will be easily understood by a reference to the accompanying engraving.

Figure 1 (see front page) represents an elevation, which is perhaps the most suitable arrangement of the apparatus as applicable to steam engines.

It consists of an upright spindle, supported in suitable bearings in a cast iron standard, placed as usual over the crank shaft of the steam engine, upon which is keyed the bevel wheel, driving a pinion on the foot of the upright shaft, whereby rotary motion is given to it. The upper part of this spindle is formed or cut into a quick threaded screw or worm, having a square, round, or angular thread, formed at about the angle of 45°, and upon, or around which is a bush or nut, having a corresponding internal screw, fitting and moving easily upon the screw of the spindle.

This bush, which may be formed of any ornamental figure on the outside, has attached to it two or more projecting arms, furnished with vanes, leaves, or plates; these vanes are so fitted upon the arms that they may be moved nearer to or farther from the spindle, and then secured by means of the wrought iron straps and screws; these straps will also allow the plates or vanes to be turned upon the arms into an oblique direction as shown in fig. 2, in order to decrease the atmospheric resistance. The bush

or block is connected to the throttle valve by means of a link, swivel joint, levers and rods, in the ordinary manner, or by any other convenient means.

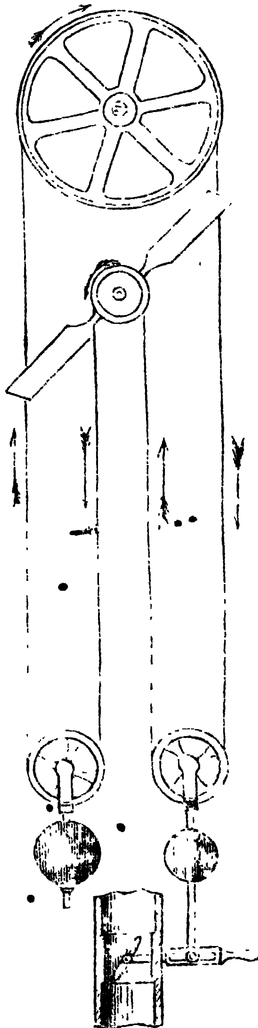
Now, it will be seen from the above description, that when the spindle is driven in the direction tending to raise the bush, the bush with its vanes will be carried round with it, and at the same velocity until and as long as the resistance of the atmosphere against the vanes corresponds with the gravitating power of the bush and its mountings; but when the velocity of the spindle is increased beyond that point, (by the overrunning of the crank shaft of the engine or otherwise,) the atmospheric resistance against the vanes will exceed the gravitating power of the bush and its mountings, and cause them to ascend upon the screwed spindle, and thus by means of its connection with the throttle valve, will diminish the supply of steam to the engine, and thereby regulate or govern its speed or rotary motion accordingly.

If, on the other hand, the velocity of the spindle is reduced below that required by the resistance of the vanes to overcome the gravitating tendency of the bush, the bush will then descend upon the screwed spindle, and by operating upon the throttle valve increase the passage for the supply of steam.

Since therefore the resistance of the atmosphere to the vanes is nearly uniform, and their velocity through it determined by a given weight in the screwed bush and its mountings, any addition or dimunition therein will require an increased or diminished velocity in the spindle, and necessarily effect a corresponding permanent change in the speed of the engine, and by means of an adjustable weight on that arm of the lever to which the vertical rod from the bush is attached, this object is fully attained at pleasure.

This apparatus may be modified to suit different situations; for instance, the upper part of the spindle may be made hollow and formed into the bush, and the revolving vanes attached to a ball, or block, fixed on the upper part of the screw, while the lower part works freely in the internal threads of the hollow spindle, thus merely reversing the position of the revolving screw, and its nut or bush, as shown in fig. 3.

Another modification of the same apparatus is made by forming the screw upon the lower end of the spindle, which is made to revolve by means of two grooved rollers or wheels, between, and in geer with which it is placed, one being keyed on the crank shaft, and the other revolving freely upon a separate axis. In proportion to the speed at which these rollers revolve, the spindle and screw, with its block and vanes, will rise and fall as previously described.



From this description, the principle of the "Improved Governor" will be un-

derstood, its action depending upon the uniform resistance of the atmosphere (or other fluid of uniform densi y,) to the revolving vane or vanes, and an uniform gravitating power reciprocally operating with every increased or diminished speed of the shaft by which the vanes are driven, so as, thereby, to adjust or regulate the speed of the engine, or other moving power with which it is connected.

The principle of action is more fully shown by a reference to the accompanying figure, which is another modification of the "Improved Governor," as applicable to situations where the crank shaft is elevated, or as in a marine or boat engine; in this case the vanes are put in motion by an endless band or belt, upon which the gravitating weight is suspended. At the calculated speed of the engine, the preponderating weight which forms the gravitating power is sufficient to drive round the resisting vanes at a certain velocity, exactly corresponding with the speed of the engine.

Any increase in that speed, instead of accelerating the speed of the vanes, raises the weight, and diminishes the supply of steam to the engine, and any diminution in that speed, allows the weight to descend and increases the supply of steam in a corresponding proportion.

In some cases, the resisting medium may be water or mercury, where the situation renders such an application more suitable, and then the oblique vane is immersed in the fluid, in which it revolves, and rises or falls in proportion to its velocity, operating as before described upon the throttle valve of the engine, or other motive power of the engine or machine, whose speed is to be regulated.

In its practical application, it will be seen that the "Improved Governor" can be placed in any situation where the common pendulum governor is at work, and in many cases without even removing the ordinary standard or support.

It is capable of very extended motion, being unlimited in the space through which it may be required to move, in order to open and shut the throttle valve of a steam engine, shuttle of a water wheel, or regulate the motion of any other Machine to which it is attached.

The speed of an engine to which it is applied, can be varied and determined at pleasure, since a change of speed to any extent may be effected by simply increasing or decreasing the gravitating power.

This governor may be had, or further information respecting it, on application to Messrs. Benjamin Hick and Son, engineers, Bolton.

Bolton, April 13, 1841.

LIFE AND LABOURS OF TELFORD.

NO. VIII.

[Continued from page 327.]

The Holyhead Road.

The Menai and Conway Suspension Bridges formed only a part of the works on a line of road which altogether presented the most striking proofs of Telford's skill in nearly every branch of his profession,—and which at length exhibited so high a degree of perfection in all its details, that it came to be considered "the best thoroughfare on the surface of the globe."—This was the Holyhead Road.

Up to the year 1815 this road, although very much frequented, remained in a wretchedly imperfect state; nor were the other arrangements for communication between England and Ireland in a more forward condition. The sailing packets of that day were often beating about for several days on the short passage of twenty leagues between Dublin and Holyhead, and then the passengers were landed on a mass of rugged rocks on the Welsh side, and then, after travelling over twenty-four miles of road in the isle of Anglesea, of so miserable a description as to be now scarcely credible, had to cross the dangerous ferry of the Menai in boats as they best might—wind and tide permitting. After passing this peril, the roads through North Wales were in most parts exceedingly narrow and rugged, often over steep mountains and by the side of precipices, from which the wayfarer was not protected by a parapet; and even during the remainder of the journey, although through the richest parts of England, the means of transit were in anything but first-rate order. Sir John Rennie, who was employed to remedy some of these inconveniences, introduced several essential improvements in the packet stations, and other matters connected with the sea passage, but it was the task of Telford to bring

the *roads* into a proper state, as well as, after Rennie's death, to complete the packet-station arrangements commenced by him. In 1811 Telford made a report to the Treasury as to the line of road to be adopted. He wished, if possible, to set out a direct line through North Wales, but found that quite impracticable, from the mountainous character of the country; he adhered therefore to a line which had been projected several years before, which passed by Capel Cerrig and the vale of the river Agwen to Bangor, and effected a saving of several miles. A multitude of minor improvements, in the aggregate of great importance, he found to be practicable, and recommended accordingly, and the old road through the isle of Anglesea he set aside altogether, and laid out an entirely new line. For four years after this report was made, nothing was done to effect its objects; until in 1815 the matter was taken up by Sir Henry Parnell, to whose subsequent exertions and unwearied activity in and out of parliament, the Holyhead Road owed much of its final excellence. In consequence of his interference, in a short time liberal grants of the public money were made by the House of Commons, and a body of Commissioners appointed, under whose control the necessary contracts were entered into, and payments made, and by whom the requisite officers were appointed. The Commissioners were responsible to Parliament alone, to whom they were to make annual reports of their proceedings. By them Telford was appointed Chief Engineer of the projected works.

Contracts were immediately opened, and in the course of the ensuing four years great progress was perceptible. In North Wales, the road making was conducted in the same manner as on the Carlisle and Glasgow road, also superintended by Telford, except that the masonry of the bridge walls and similar erections was not composed of sandstone, but of schistus, or slate-rubble. The largest bridges were of iron, but with stone abutments. In order to ensure a durable road, the bottom was regularly paved with schistus, on edge,—on which was placed a layer of broken stone or "top metal," five or seven inches thick, composed of basalt, porphyry, limestone, or grauwacke, to procure which was sometimes a most difficult task, most of the stone in North Wales being schistus, and consequently of too soft a nature for the purpose. Over all was laid a thin coat of gravel, that the surface, by binding, might become of a hard and smooth consistence. This whole road, over a rugged and mountainous district, along rocky precipices, and across wide inlets of the sea, on which the mails and other coaches now travel at the rate of ten miles an hour, proved a most arduous undertaking, and occupied fifteen years of unremitting labour on the part of all concerned, amongst whom the Chief Engineer had by no means the lightest task.

The greatest operations were the embankments, one across an estuary near Holyhead, called Stanley Sands, and the other at the approach to the Conway Bridge. The former of these is 1300 yards long, and 16 feet in height? the top is 34 feet wide, and the base 114 feet. Both sides of this huge mound are coated with rubble-stones, which simple precaution has been found effectually to protect the whole fabric from the attacks of the strongest storms. By great good fortune, a rocky bottom was discovered for the foundation of the tidal bridge which it was necessary to erect for the passage of the waters, so that the entire structure is of unimpeachable solidity. The other embankment, at Conway Bridge, is 666 yards in length, but of much greater height, being no less than 54 feet. This causes the breadth at the base to be 300 feet, although at the top it is only 30. The tide here, which flows to about 10 miles above the works, is so strong that on one occasion it carried the whole embankment, so far as it had been completed, clear away from the very foundation. The works, however, were resumed, and the exterior having been protected by a rubble coating, no signs of its giving way have ever since been perceived.

Among the other great improvements on this part of the line may be noticed the road along the stupendous sides of Penmaen-Mawr, where formerly the rough and narrow pass was undefended by a parapet, and the traveller was every moment liable to fall over perpendicular precipices of immense height. All these inconveniences are now remedied; while another hill of the same character,

Sychnant, 543 feet above the level of the sea, has been wholly avoided by the new line. Altogether, the road through North Wales, notwithstanding the great and almost insurmountable difficulties it presented, has been rendered as safe, smooth, and easily-travellable (except with regard to some few hills) as many roads in the flattest and most populous parts of England.

Between Shrewsbury and London difficulties of a different nature had to be encountered. In this distance there were seventeen different sets of road-trustees, each of which had its own surveyor, and each of which was required to give its consent to the carrying out of any improvement, before a contract could be entered into. It is needless to say that under this state of things little progress could be made; but at length the Parliamentary Commissioners obtained a new act, in pursuance of which they were enabled to levy an "improvement toll" not exceeding half of that payable to the trustees, and to assume other powers, independent of those functionaries. This done, comparatively few difficulties remained, but in a few years, by unremitting exertions, the Holyhead Road became what it now is,—the very model of a turnpike road. The Commissioners, by virtue of the powers delegated to them by the Acts of Parliament, retained the roads in their own hands for two years after the completion of the improvements,—a highly necessary measure, since very much depends on the manner in which the repairs are conducted, after the first starting off on a new line. As after this period they generally fell into the hands of Mr. M'Adam, it is needless to say that the improvements carried into effect by Telford ran no risk of being suffered to fall into decay, and were as safe from spoliation for want of skill and attention as if they still remained under his own superintendence.

The Holyhead Road was the last great work of the kind executed by Telford, but a considerable portion of his time, during the later periods of his professional career, was occupied in the making of elaborate and minute surveys, under the direction of the Post Office, and at the expense of the public, of several of the principal lines of mail-coach road, with a view, by shortening and improving them, when it could be done, to expedite the delivery of letters and newspapers, in accordance with the "keep moving" spirit of the age. Amongst these, was the great road through South Wales, and also the important line from Liverpool to the junction with the Holyhead Road between Birmingham and Coventry. The whole line of the Great North Road, from the metropolis to Edinburgh, was also surveyed with the same views, the result being the recommendation of a diversion from the old line, by which the distance would be reduced from 390 miles to little more than 360, so as to lessen the time of communication between the two capitals by no less than *at least* three hours!

It is of course a pity that these expensive surveys were ever undertaken, and, instead of an unfortunate, a most fortunate occurrence that the works recommended in consequence were never carried into execution, If they had been, the introduction of railways and locomotive engines would have superseded the "perfected" roads and horse-drawn mail-coaches almost as soon as the former had been fit for the reception of the latter,—and so much capital as had been expended on them would have been lost to the country for ever. It was a remarkable trait of character in Telford, that he could never prevail on himself to admit the merits of the railway system. Even in 1834, he lamented over the fact that "nothing had *yet* been done" to carry his road improvements into effect; in 1834, years after the Liverpool and Manchester Railway had demonstrated that a new era was commencing, and shown, to all but those who *would* not see, that steamers and iron rails must soon give the go-by everywhere to broken stone and horseflesh. But Telford had all his life devoted his energies to the perfecting of the old system, and he seems to have continued to the last, in spite of adverse facts, in the obstinate belief that this old system was not to be excelled. This seems rather strange in one whose whole life was spent in the achievement of improvements which common minds were ever ready to pronounce impossible, until they were actually effected. But so it was. Telford appears to have considered Railways merely as the product of a temporary mania for speculation,

and never, for himself, recommended the construction of any, except as a substitute for canals, in situations where water might be scarce, and heavy goods were the articles requiring transportation. "'Tis true, 'tis pity; and pity 'tis, 'tis true!"

Now that railway travelling is so universal, and the wonders of celerity performed by it so familiar, it is not unamusing to observe with what anxiety, so few years back as the date of these surveys, whole lines of country were mapped out, their levels taken, and innumerable costly improvements projected, with the view of saving some few minutes of time (by dint of pushing the horses employed almost beyond their powers) in the distance between London and Edinburgh. How soon has the "unconquered arm" of steam numbered all these considerations with the things that were!

Telford sums up the result of his labours in road making with a natural complacency. "The perfected roads having justified a corresponding improvement of wheel-carriages," he observes, "a rapid intercourse was established, first in mail-coaches, and eventually in vehicles of all kinds, until the usual rate of travelling had increased from five or six miles, to nine or ten miles per hour." Ten miles per hour! just half a common, one-third of a respectable, and one-fourth of a first-rate railway speed!

URWIN'S STEAM-ENGINE IMPROVEMENTS.

Sir,—I beg to make a few observations through the medium of your Magazine, in reply to "Nauticus" and "S."

Let us suppose a condensing engine to be working with a pressure of three pounds pressure on each square inch of the safety-valve, and another of the same size at six pounds; assuming the air-pump and vacuum to be as usual, which gives an advantage to the high pressure steam. Then, according to the reasoning of your correspondents, the effect would stand as 3 : 6 or 1 : 2, or one would be double the power of the other. But suppose, on the other hand, the vacuum were equal to twelve pounds (for illustration sake,) which must be considered a common case, then by adding 12 to each of them, the ratio becomes as 13 : 16, which alters the case altogether. Again they must not assume, that because the receiver is three times larger then the cylinder, the steam must have to expand into four times its previous volume. It will depend on the pressure in the receiver, which may be found by a few trials and attending to the following rule:—Multiply the pressure in the receiver and in the cylinder into their respective areas; and divide by the areas of both the receiver and cylinder.

Example.

Call the area of the cylinder $=1$, and that of the receiver $=3$; the pressure in the cylinder at the termination of the stroke $=6$, and that in the receiver, previous to opening the communication between the receiver and cylinder$=4$. Then, according to the rule it would be $6+15\times1=21$; $4+15\times3=57$; and 21 and $57=78$, which divided by both the areas, thus: $\left(\frac{78}{4}\right)$ gives for the product $19\frac{1}{2}$; and by subtracting 15, for the effect of the atmosphere, $4\frac{1}{2}$ will remain as the effect in the receiver. And the like will be the case for any variation of size the receiver may admit of.

The object of my improvement is to turn the steam to good account after it has been used to the best advantage according to the systems previously in use. Of the great saving effected by them, the *Hercules* steam tug now at work on the Thames furnishes incontestible evidence, which every one may readily refer to. "Nauticus" writes as if he knew something about this vessel, and as I do not wish him to conceal any thing he knows on the subject, I would be happy to know from him through the medium of your Magazine what his opinion is of the working of my system as applied to that vessel.

I am, Sir, your obedient servant,

ROBERT URWIN.

South Shields, April 24, 1841.

EXPLOSIONS IN COAL MINES.

Sir,—The recent catastrophe at the Willington Colliery with a loss of life, amounting to between 20 and 30 persons, is only one of a constantly recurring series, though happily not generally

numerically so great as to the sum of its victims.

It may be asked with astonishment what has Parliament done to lessen or mitigate these cruel contingencies? Alas! nothing:—party contentions and personalities quench all considerations which embrace the cause of humanity. The recommendation of the Committee of the Commons for the prevention of accidents in coal mines, remains on the Statute Book a "dead letter"—useless and inert. For any efficient purpose of good accomplished, the Committee need not have been appointed, or the inquiry been made, and the hoodwinked miner may still believe with Mr. John Buddle, that Davy's Lamp is infallibly and absolutely safe. I wish I could believe so too, and were fully persuaded that the Lamp in question was never in fault, but that the cause of accidents, like these, was to be sought for in circumstances in which the Lamp had no share.

If we are "to swear" by this invention, as it is, farewell to any *improvement* that might otherwise be made in it,—and if it cannot be improved, (in its present imperfection,) and we cling *per fas aut nefas*, to this forlorn hope—there is an end to all exertions to discover an absolutely safe substitute. It is a fearful thing for men to peril their lives on a *peradventure*.

Dr. Graham has, with more boldness, perhaps, than discretion, ascribed *all* the explosions which have occurred where Davy's Lamp has been in use, not to the faultiness of the Lamp, in any case; but invariably to recklessness, or the want of proper precaution, on the part of the poor miner, who becomes the victim and does not survive to "tell the tale." The only witness being destroyed, bold assumption vindicates the infallibility of the Lamp, and condemns the victim, as if the penalty of death were not a sufficient infliction. Dr. Faraday, however, a wiser man, admits that he *knew* the "Davy" to be UNSAFE; and, albeit, the opinion referred to, several inventions have recently been proposed, showing that in "its compunctious visitings of nature," the mind is dissatisfied with Davy's invention, and becoming restless and uneasy.

For my own part I am, unhappily for my peace, not in the habit of thinking by proxy, "*Nullius addictus jurare in verba Magistri*"; hence, I have had to bear much that is painful in the opposition that has been made to me in defending what I believe to be the truth. Davy's lamp, in *its best estate*, must explode if it passes across a blower. It is unsafe if *copper wire* be used instead of *iron* wire gauze. In the case of *currents* charged with fire damp, or when the lamp being put in motion, traverses an explosive atmosphere, the lamp is not only not trustworthy but is highly dangerous —it is, indeed, I more than fear, a "broken reed" in cases like these.

In the experiments made before the Committee, Davy's lamp *invariably exploded* in the mimic blower. On this occasion several "Davys" were employed, and Mr. Peireira was supplied with that belonging to the University class (*Dr. Graham's own*); *a fortiori*, it must explode in the "blower" of the mine; common sense discerns this, though

> "He that's convinced *against his will*,
> Is of the same opinion still."

So sings, or says, Sir Hudibras, and were it a mere matter of speculation or theoretic curiosity only, it might be a matter of indifference; but the question assumes a fearful import when such a frightful expenditure of human life is at issue. Perhaps not less than *one thousand lives* have been sacrificed, from first to last, in the various coal mines which have been superintended by Mr. John Buddle. Has the waste of life been materially diminished since the introduction of Davy's invention in 1816?

As long as I live, let the hostility arrayed against me be what it may, my feeble voice shall be ever raised in the sacred cause of humanity.

I am, Sir,

Your most obedient servant,

J. MURRAY.

May 7, 1841.

WALKER'S PATENT UNIVERSAL WATER ELEVATOR.

Sir,—In my last communication I alluded to a patent recently granted to Mr. Walker, of Crooked-lane, King William-street, for a new application of the momentum of fluids.

The singular property of fluids made subservient to useful purposes in this novel and ingenious instrument—whose

very attribute is simplicity—is precisely that which Montgolfier enlisted in his service nearly half a century ago. A full description of Montgolfier's hydraulic ram may be seen in your 16th volume, page 233. In the hydraulic ram the momentum was obtained by means of a long column of water being permitted to flow down an inclined main, which being suddenly stopped, the momentum acquired by the whole mass in falling through a limited space, was sufficient to raise a small quantity of the fluid to elevations of from 50 to 80 feet.

Mr. Walker's elevator consists simply of a straight pipe or tube of zinc, from 6 to 10 feet long, which, for convenience, may be separated into two parts by a screw joint at *a*; at the lower end there



is a conical shaped aperture *b*, furnished with a metallic valve opening upwards; the upper extremity is fitted with a nosel or jet pipe *c*. The whole weighs about 6 or 7 pounds. In use, the lower end *b* is immersed in a pail, cistern, or other vessel containing water, and the instrument worked up and down with a jerking motion, when a series of jets of water will be successively projected to a considerable distance (generally about four times the length of the instrument).

For watering gardens, a fan or spreader is affixed to the nose-pipe, when the water falls in an agreeable shower upon the thirsty plants. When it is desirable to project a body of water to the greatest possible distance, it has been found that Merryweather's form of nose-pipe (described at page 37, of vol. 25) is far superior to any other that can be employed. Thus equipped, it forms an admirable domestic fire-engine, well adapted to stop the progress of commencing conflagrations; when filled with water, the tube can be taken into an apartment and the water contained in it projected on the flames much more efficiently than could be done with a bucket.

As there is no working part—there is consequently no *wearing part*, and the durability of the instrument will be as great as the metal of which it is composed. It can be used by any person in any situation in a few seconds, and if laid by neglected for twenty years, it will always be ready for action with certainty and effect at a moment's notice.

In banking houses or large establishments, the patentee proposes that some of these instruments should be laid on hooks over the mantle-piece, or in the hall. On board of ships, in barges, and the foundation of buildings, they may be employed with great advantage.

The patentee is about to fit up these instruments to work by suitable mechanism, and by applying an air-vessel and leather hose, to enable them to deliver a continuous stream of water at any required point. But in the simple form depicted above, costing but as many shillings as the ordinary garden engines cost pounds, it seems likely to be very extensively employed by those who cannot afford to possess themselves of the more costly contrivances.

I am, Sir,

Yours, respectfully,

WM. BADDELEY.

29, Alfred-street, River-terrace, City-road,
May 5, 1841.

ON THE SUPERIORITY OF CORNISH SINGLE LIFTING ENGINES TO ROTATIVE.

Sir,—Every week I expected would leave me time to arrange the many facts I have been gathering in support of these papers; but each week has brought its own occupations, and I cannot anticipate, for some months, sufficient leisure to continue the subject as fully as I could wish. I will however give the general results of my investigation, that I may, at any time, return to the question, or answer, shortly, the observations of your correspondents.

I thank "S." for the courteous manner in which, desirous of assisting enquiry, he has called my attention to the duty of the Cornish rotative engines. But the theory were nothing unless it would embrace more or less every engine of the same class—that of continuous action. It applies certainly to a greater extent to those engines of the usual number of revolutions; but those referred to by "S." do in reality support the theory, for they seldom make more than 8 or 10 revolutions a minute, and thus one chief cause of their superiority to the usual rotative engines. I have seen many of the best engines in Cornwall, and know their action; and "Lean's" reports I was in possession of. The fact of a few Cornish rotative engines doing greater duty than the single lifting engine of nearly the same capacity does not affect the question. The number of strokes are certainly more, and cannot give the same time for exhaustion; but it only proves that other circumstances which equally affect extraordinary duty, as the difference in exhaustion, are not the same; and consequently that such lifting engines are not performing the duty they ought to perform. By reference to "Lean's" historical statement it will be seen that no more fuel is required to evaporate a given quantity of water under whatever pressure. The duty of all engines, then, must depend (*cæteris paribus*) upon the pressure in the boiler and the expansion of the steam to its extreme limit, in cylinders large enough to permit it to give out all its own power, with the required power for the load, until the steam shall enter the condenser at so low a pressure (say 6 or 7lbs below the atmosphere) as just sufficient to overcome the friction at the end of the stroke.

"M. J. R." (No. 921) will find in the greater exhaustion of the cylinders of single lifting engines an answer in part to his question. Though the Cornish rotative engine does not make above 4 or 5 strokes more than the single lifting engine, yet wherever a crank is used, its continuous action must ever prevent that beneficial pause for evacuation, that gives to the single lifting engine so great a superiority. The particular engines, however, of his comparison cannot be working under equally advantageous circumstances to leave so great a difference in duty; the better exhaustion alone is insufficient to account for it. Mr. Seaward made a similar observation as "M. J. R." on the inefficiency in marine engines of steam used expansively, of a high pressure as in Cornwall; 33lbs. pressure was used in several Scotch boats, but the expansive principle did not operate so well in the rotative as in the pumping engine. The increase of duty is then to be attributed to *other reasons* than the effects of percussion. (See discussion on "Mr. Parkes's" paper.) These reasons were not assigned by any one, at that or the other meetings. The fact of there being no better exhaustion is here the chief reason why the same corresponding advantages were not obtained. Independent of a little better clothing, and of the saving by the cushion of steam, where else shall we find so reasonable an explanation? With these exceptions, the circumstances of trial were the same. I can hardly suppose that this has not occurred to many before; it is too evident to escape notice; but I have no where seen the difference in duty so accounted for; though the extracts I have made to illustrate these papers would fill 30 or 40 printed 8vo. pages. The following are my deductions from them:—

1st. That whilst Cornish lifting engines have encreased their duty, from 27 millions of lbs. (the *best* performances of Mr. Watts's engines at Herland, in 1798) to an *average*, on 54 engines, 54,500,000lbs.* the rotative engines have retrograded in duty.

2nd. That Mr. Watts's rotative engine in 1787 consumed an average of 8lbs. of the best coals, per nominal horse power, per hour. That the actual power was from one half to two thirds greater than what they were rated at. The steam pressure was nearly always 2lb. *less* than the atmosphere, and never used expansively; the condenser vacuum never more than 27"; temperature of condensement 100 to 105°; and the greatest mean exhaustion of the cylinder, under the best circumstances, and the engine being in its very best order, was 10¾lbs. When the steam was used at a mean of 3lb. above the atmosphere, the mean cylinder exhaustion was never more than 9lbs. and at the end of the stroke 11½lbs.

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* Lean's Report of August, 1840, containing the trials for the satisfaction of the deputation from the Dutch Government. The best was Wheal Vor, 80 in. (stroke 8 ft.) 123,300,593lbs. In October, 1835, Fowey Consols engine (Austen's) same sized cylinder (stroke 9 ft.) did 125,095,713lbs.

Question, 1. Is it possible (even under the best circumstances of order of engines, &c.) to get a greater mean cylinder exhaustion than 11lb., with a condenser vacuum of only 27°?

Question, 2. Whether, with such a condenser vacuum, a greater mean exhaustion than 9½, can, on the average, be fairly reckoned on with the usual working order of engines, and mean steam of 3 or 4lb. above the atmosphere? Mr. Watt calculated upon getting only 9lb. (under any circumstance) for his *average* exhaustion.

3rd. That Mr. Watt paid particular attention to the state of exhaustion, *in reference to power and duty*, and preferred the less, from so great a resistance to the piston, to a better condenser vacuum that would have diminished it. This will appear a contradiction, but it is founded on the truest principles of scientific investigation of the best combinations to ensure most duty.

4th. That the average consumption of the best rotative engines of the present day is, at the lowest, 8lb., per nominal horse power, per hour. There has been much difference on this point—the majority, and best opinions, making it 10, and some 12lbs. I take the lowest of any. The steam pressure varies from 4 to 7lbs. (except in tugs where it is raised to 12, 14, and 20lbs.) and is generally used expansively. The condenser vacuum varies, between 27°, 28° and 28½° of the common barometer; the mean cylinder exhaustion is too inaccurately taken to be relied on; but is always above 10lbs.; 12.3 being the highest. The actual power, is, (according to Mr. Russell, p. 696, *last edition Encyclop. Brit.*) from one-fourth to one-third more than their nominal powers in engines of the best makers.

5th. By comparing 2 and 4 it will be seen, that to form a correct opinion of the difference in consumption of rotative engines of 1789, and the present day, the same circumstances of working must be applied. Consequently the expansive pressure at which engines now work, must be added to the low pressure inexpansive working of Mr. Watt's engines, because he might have obtained this increase with no greater consumption of fuel. This would give to his engines 4, 5, and 6lb. additional power per square inch, and thus increase to a great extent the actual working power of his engines. Therefore whether upon the nominal or actual power, rotative engines of the present day consume much more fuel than they did 54 years ago.*

6th. That Mr. Watt invented, and discovered, all that is valuable in the steam engine as it exists to this day. That he correctly proportioned its parts, and that whenever those parts have been departed from there has been a loss of duty just in proportion. That he never, during his long life, made one error in principle or practice, through all the perplexities of his large and novel business; himself, like the sun, the centre of all, without whose power his satellites stopped still. He erred in the extent to which his expansive principle could be carried, but perhaps he thought few would run the risk of such vast boilers of explosive matter of 40 and 50lbs. to the inch.* Prudence is but a question of feeling.

7th. That as the very best performance of Mr. Watt's rotative engines, when in the very best order, was a mean exhaustion of only 10¾lb., that as they performed more duty with this mean, than engines now perform with a greater mean, no greater mean than 9½lbs. or 10lbs. can be fairly reckoned upon, (under circumstances for best duty) on the average working state of engines. Hence there is throughout the stroke a difference, between the superior exhausted cylinder of Cornish single lifting engines and rotative, of 3½ or 4lbs. on every square inch of the piston, to resist the effective steam pressure on the other side; allowance having been here made for the difference of extreme condenser vacuum of the two.

It follows, that after considering what is due, 1st., to the great economy of working steam expansively at a very high pressure; 2nd., to the cushion of steam; 3rd., to better clothing—the other cause, that produces so great an effect, is a more perfect cylinder exhaustion. This cause ranks in importance after the first of the four; and can alone account (with the others) for the great difference between the duty of the single lifting engine and the rotative. Thus we are not obliged to have recourse to the theory of percussion, which is erroneous. I regret I have not leisure to go into the merits of calculation, to assign the due proportion to each of the four causes. But the data are now before the public, to be admitted or rejected upon investigation, and each can work out the results.

In submitting to your readers this rough synopsis of a considerable collection of facts, I would observe that I have drawn from them

* The fact that modern rotative engines of the best construction (in 1827) consumed more coals than Mr. Watt's was proved by trials between his old engines, made 40 years ago, and the modern ones. (See *Farey*, p.p. 473, 486) The engines of the present day, it has been seen, (2 and 4) consume more fuel than Mr. Watts; so no adequate improvement can have taken place since 1827.

* Steam navigation can never compete with Cornish duty, until fresh water can be supplied to the boilers, and they are made strong enough to bear an equal pressure. Even then they would consume considerably more fuel, for the causes before mentioned

and from the practice of Mr. Watt, in comparison with the practice of the present day, this conclusion:—that the pistons of all rotative engines of the usual kind are clogged with a mean resistance of 3½ or 4 lbs. on the square inch throughout the whole stroke, from which there is no escape; that it is one of the conditions of its existence; and that the less this resistance is reduced below 3½ lbs., the greater is the loss in power and duty. Mr. Watt never varied his practice of 27° condenser vacuum.* He expressly observes, "it is better to have this resistance to the descent of the piston than to throw in more injection water." In art or nature there is a standard of perfection; less discoverable perhaps in taste, though the man of native taste can no more err than he can walk on his head. But in physical science there are certain conditions, as in pure mechanics there are certain combinations, which ensure the greatest results. We alter them, but gain nothing in the end. We require accommodation in mechanics, and vary the application accordingly, but we gain no more power. Everything in nature has its maximum effect. It is therefore no reply to these observations for engineers to produce diagrams of 12 lbs. mean, and say, "the difference of exhaustion cannot always be so great as you make it—I actually get 12 lbs.—you limit the standard to 10 or 11 lbs.!" The difference only changes places, and the inevitable loss is discoverable in a still greater consumption of fuel. It is the object of science to discover the best conditions for excellence. Mr. Watt tried more experiments with condensation than any one, and with far more accuracy. He assigned 27° extreme vacuum as the limit; and with this he could get no more than 10¾ mean exhaustion at the best, and 9 lbs. on the average. Those who do more, must produce the only test of greater excellence i. the same work done, with a proportionate reduction in fuel, or their results will only mislead. If the engine could, without exerting any of its own power, get rid of the injection water, there could be no other objection to an unlimited quantity, to ensure a greater mean cylinder exhaustion, beyond the greater consumption of fuel to raise the temperature of the condensement reduced so much below the best state—100°. But power is lost as well as duty. Every gallon of water thrown in, beyond what is necessary for a vacuum of 27, must again be lifted out by the engine; nor is it the dead weight of water alone, for every additional gallon must raise the discharge valve sooner, and thus throw 13 or 14 lbs. on every square inch of the air-pump bucket much earlier than otherwise. Thus the engine will exert a greater portion than usual of its own power to relieve itself; and by so much reduce its available power. If then, these two sources of loss—loss of power, and loss of duty—be weighed against the gain, whatever it is beyond 11 lbs., it will be found that more is lost than gained by the greater cylinder exhaustion.

Pressure in vacuo is given out at very low temperatures; though the vacuum itself is formed as quickly as an explosion of gunpowder, yet the mixture continues a long time giving out its appreciable resistance; and it would require a very great quantity of injection water to reduce it to nothing. Can we then suppose that Mr. Watt, who discovered or proved all this—who invented the indicator expressly for the purpose of ascertaining the difference between his cylinder exhaustion and condenser vacuum—could have been ignorant of these things, or did not take them into consideration, to reduce, by a greater mean exhaustion, if he could without entailing other disadvantages, this serious deduction from the power of his engine? So apparent as they are to ourselves, by what process of induction on the operations of a great mind can we arrive at such an illogical conclusion? What then is the use of these extreme cylinder exhaustions, when more fuel consumed is the final result? Monsr. de Pambour's experiments with indicators are useless in reference to power and duty; he gives neither the condensed vacuum nor temperature of the condensement; he merely gives the naked facts of what the exhaustions are; and these serve only to mislead. Any one may, by pouring in rivers of injection, get what mean exhaustion he pleases up to 12½ or 13 lbs., if the eduction valves and injection passage are cleverly made large enough for the purpose, and then show by his diagrams the enormous actual working power of his engine, as evidence of its excellence. Let him, however, say nothing about its consumption.*

Though my great admiration of Mr. Watt arose from my descent to four of the deepest Cornish mines in 1839 (one, the Great Consols, more than four times as deep as St. Paul's is high) I never felt to such an extent, as in considering the many conditions which bear upon the subject of these papers, those peculiar properties of his mind, comprehensiveness and exactness.

To those who proceed with this investigation I would say:—do not be deterred from

* This is in opposition to Mr. Russell's formula, published in your Magazine some time back. That is too limited in other principles it embraces, and too greatly contradicted by the best practice to be accurate.

* A certain professor has gravely given the actual power of engines as more than 100 per cent. over the nominal, by diagrams of this kind! He did not give the consumption of fuel.

the pursuit by one or two facts which, at first, may appear to contradict it. Examine whether they are strictly applicable, for unless we are satisfied that our facts are of the same class, and unless we take the trouble of ascertaining that the contradictions cannot properly be attributed to other causes, that do not affect the question, it is useless to pursue any subject to its true source. We may be assured that, if the laws or principles we start with are sound, we have planted our foot on nature, and cannot be uprooted. Like a great river that sweeps all little streams in its course, and compels them to swell its volume and contribute to its grandeur, so will sound principles compel apparent contradictions to bend to their native truth, and give them additional strength for their edification. It requires no talent, no exertion—only patience in not jumping too hastily to conclusions; for Lord Bacon has kindly observed as an encouragement to all, "a cripple in the right way may beat a racer in the wrong."

I am, Sir,
Your obedient servant,
SCALPEL.

April 28, 1841.

Postscript.—The preceding was written, entirely, previous to the appearance of S.'s last, wherein I see he has candidly corrected the application in his first paper. The *Quarterly Mining Review* had escaped me, and I read for the first time, in your Magazine, that my theory is not new. With myself, however, it is original. As other sources of information may also have been left unnoticed by me, may I trespass, to name the works from which my facts have been collected, and to which I referred? Mr. Watt's notes to Robison's Steam articles, reprinted in 1818 from the Encyclop. Brit.; Stewart; Partington; Tredgold; Farey; Lardner; Farey's article in Rees' Cyclop., Galloway; Arago's éloge; the *Mining Journal* for last year, and correspondence on duty of engines therein; the proceedings of Institution of Civil Engineers, and other bodies where the subject has been discussed; Lean's reports; Lean's historical statement; all the parliamentary reports on steam navigation, and evidence before Committees from that on steam navigation to India in 1824; and Mr. Scott Russell's article, "Steam Navigation," in the new edition of the Encyclop. Brit. Of these works, by far the most valuable, in accuracy, in investigation, scientific discussion, and useful registers of the performances and proportions of Mr. Watt's engines, is Farey's work (1827). This might be expected, as he was on terms of intimacy with the great engineer, who kindly furnished him with all its valuable contents. The errors in *all* the others, except Lardner, are surprising.

I was fearful I might be misunderstood about the speed of the Cornish piston, and sent an explanation of that part before the paper was printed. But having no drafts of my papers I did not probably refer to it with sufficient accuracy to admit of the correction. In those engines which do most duty, the piston rests a little while at the top, and the eduction valve is opened a second, or even more, before the steam valve. Now although the piston, when in motion, travels at the usual rate, the steam has got such a start of it that the piston does not move fast enough to overtake it, to feel the resistance of any uncondensed steam. There will always be that resistance due to the vapour in the condenser; but this is clear—it is not analogous to that mean resistance which, in rotative engines, retards the piston so considerably. The eduction valves of the present rotative engines are made with twice the area of those of Mr. Watt, and yet their duty is less. Ask any engineer the reason, and he will say, the object is to give a quicker passage for the steam to the condenser. But what is the use of this, or where are those true principles of science which guided Mr. Watt in making them smaller? With injection water, proportioned to get no better extreme vacuum than the best (27°), the exhausting valves need be only large enough to let the steam escape as quickly as it can be condensed by that quantity of water; to make them larger assists not the process or time of condensation, but loses more steam by clearage, and power by friction. How is it that even with the use of expansive steam, and perhaps better clothing, rotative engines have retrograded in duty? Because every part, in reference to the final result, has not been considered, as it was by Mr. Watt. It seemed to be so evident that the larger the exhausting valves, the greater the mean exhaustion, and therefore the greater the power, that Mr. Watt's science was looked upon as that of a pastime, the result of some fortuitous arrangement; not that the proportion of every minute part, and the ascertainment of the best cylinder exhaustion, were determined by deep thought and laborious experiments. And what test do they now give us of greater excellence? None! on the contrary a retrogression in duty is discovered after a practice of half a century! I have given reference to the works from which I have drawn these FACTS; those who doubt them can easily track my steps; and if I should not readily reply to objections, it will only be when it is apparent that the parties take no pains to search and correctly compare.

To Mr. Galloway seems due the credit of first noticing the difference of exhaustion as a means of duty; but though so old it deserves reviewing, for it has been quite overlooked in the many late discussions. It is rightly observed, too, by Dr. Hartley, that

"any hypothesis which possesses a sufficient degree of plausibility to account for a number of facts, helps us to digest those facts, to bring new ones to light, and to make *experimenta crucis* for the benefit of future inquirers."

April 29, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

⁎ *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

JOHN DUNCAN, OF GREAT GEORGE-STREET, WESTMINSTER, GENTLEMAN, *for improvements in machinery for cutting, reaping, or severing grass, grain, corn, or other like growing plants or herbs.* (A communication.) Enrolment Office, May 1, 1841.

In front of the machine, on the right hand side of the shafts, there is a conical frustrum with a circular cutting plate at its base; several cutting instruments like small scythes are affixed to this plate, and below them a series of fingers project from the bottom frame of the machine, which gather the corn &c. together, and hold it against the cutters. The frustrum is set in motion by its connection with one of the running wheels, and as the corn is cut it revolves with the frustrum, and is carried round to the body of the machine where it is collected. The claim is to the combination of the fixed projecting fingers with the revolving cutters, and also the combination of the frustrum with the revolving and stationary guides by which the crop, when cut, is confined to and discharged from it.

ELIJAH GALLOWAY, OF MANCHESTER-STREET, GRAYS-INN ROAD, ENGINEER, *for improvements in propelling railroad carriages.* Enrolment Office, May 1, 1841.

On the middle of the axle of each pair of running wheels a small double flanged wheel is placed, in contact with a moving rail in the centre of the line of railway, supported on anti-friction wheels. Motion is given to this rail by a stationary engine, which propels the carriages by contact with the small wheel.

The claim is to the mode of propelling carriages on railroads by the application of a moving rail or bar, acting against a wheel or wheels, of different diameter, to the other wheels of the carriage, by which means carriages can be propelled on railways at a much greater velocity than the speed of the moving or propelling rail or bar.

JOSIAH PUMPHREY, OF NEW-TOWN ROW, BIRMINGHAM, BRASS-FOUNDER, *for certain improvements in machinery to be employed in the manufacture of wire hooks and eyes.* Enrolment Office, May 1, 1841.

Instead of the usual methods of planishing wire hooks and eyes, this patentee employs a pair of dies, the lower one being fixed, the other moved vertically by an eccentric on a horizontal shaft driven by steam or other suitable power.

HENRY WIMSHURST, OF LIMEHOUSE, SHIP-BUILDER, *for improvements in steam-vessels, in communicating power to propellers of steam-vessels, and in shipping and unshipping propellers.* Enrolment Office, May 1, 1841.

The first improvement consists in strengthening that part of the vessel in which screw propellers work, by the application of a main body post and a lower buttock.

Secondly. In the mode of communicating power to the propellers: the propeller shaft is connected by a coupling-box to one end of a horizontal shaft, to the other end of which is fastened a cog-wheel. This cog-wheel is driven by means of two others turned by a steam-engine. Motion is also communicated to the horizontal shaft by endless bands which pass round a drum fixed on this shaft and round drums on the axis of each of the two cog-wheels. The propeller is detached from the driving shaft when required by disengaging the coupling box.

Thirdly. For shipping or unshipping the propellers, the propeller shaft has its bearings in two angular bars, on the lower end of which there is a projection which enters a recess formed in the metal braces that unite the body post with the keel and stern post. The upper end of each bar passes through the trunks, where they are made fast when in use; but when it is required to unship the propellers, the stems are raised till the studs are lifted out of the recesses. The propellers are then drawn from under the vessel by means of suitable tackle previously attached for that purpose.

The claim is 1. To the mode of applying a body post as described.

2. To the mode of communicating power, by the combined means of cog-wheels and bands or straps, to propellers.

3. To the mode of shipping and unshipping propellers.

JAMES HEYWOOD WHITEHEAD OF THE ROYAL GEORGE MILLS, YORK, MANUFACTURER, *for improvements in the manufacture of woollen belts, bands and driving straps.* Enrolment Office, May 1, 1841.

These improvements refer to the adaptation of woollen belts as a substitute for leather for driving machinery. The woollen belt is passed through a composition of 8 lbs. of linseed oil and 2 lbs. of resin. The oil is boiled, and the resin added in the state of powder, and the mixture stirred till the ingredients are thoroughly incorporated. The

belt is passed through this mixture and between weighted rollers, and is then well stretched lengthwise and dried, when it is fit for use.

JAMES BOYDELL, JUN., OF CHELTENHAM, IRON MASTER, *for improvements in working railway and other carriages, in order to stop them, and also to prevent their running off the rails.* Enrolment Office, May 2, 1841.

For the purpose of stopping a railway carriage, a projection is affixed beneath it, carrying the axis of a break lever, the lower end of which is enlarged and embraces the rail, being lined with wood to create friction. Whenever it is desired to stop the carriage, the break is brought in forcible contact with the rail by means of a second lever and connecting links.

In order to prevent carriages running off the rails, there are two bars placed beneath each carriage extending from opposite corners and crossing beneath the centre of the framing, from which they are suspended by a pin passing through a slot in the middle of each bar, and having sufficient play to permit the train to move easily over the usual curves.

The ends of the bars, are connected by pins to those of the carriages before and behind, thus forming a continuous line of bars, which will in most cases keep the carriages on the rails; or should one carriage get off the rail it will be prevented from running at any great angle with them.

The claim is 1. To the mode of applying apparatus acting by lever pressure on the rails, as a means of stopping carriages as herein described.

2. To the mode of applying bars to prevent carriages running off the rails of railways.

JOHN EDWARD ORANGE, OF LINCOLNS-INN, OLD SQUARE, CAPTAIN IN THE 81ST REGIMENT, *for improvements in apparatus for serving ropes and cables with yarn.* Enrolment Office, May 1, 1841.

This invention consists of an improved serving mallet, so constructed as to serve ropes or cables with yarn, and at the same time carry a supply of that material, so as to dispense with a second person, heretofore required, to hand the yarn round the rope. For accomplishing this object, a yarn holder consisting of a copper ball, is attached to the upper part of the serving-mallet; the upper part opens on a hinge joint to receive a ball of yarn, and is then closed by a catch and wedge. The yarn passes out through an opening in the under side of the ball, thence under a friction crank on the side of the mallet, for giving any required degree of resistance to the passage of the yarn.

The claim is to the mode of combining serving-mallets with apparatus for holding yarn, and governing its winding on a rope or cable as described.

HERMAN SCHROEDER, OF MARK-LANE, LONDON, BROKER, *for improvements in filters,* (partly a communication). Enrolment Office, May 1, 1841.

These improvements relate to bag filters, principally employed for filtering the syrups of sugar. In the first place, these filters are constructed of a number of bags either plain or plaited, and into the mouth of the bag a frame is inserted, provided with suitable apertures for the entrance of the syrup. The bags are placed within a box fitted with a perforated false bottom, on which the bottoms of the bags rest, their mouths with the frames being near the top of the box and secured in their places by wedges; the syrup being poured into the upper part of the box above the frames, runs into the bags, through which it filters and may be drawn off at the bottom of the box by means of a cock.

Another improvement consists in attaching a number of small bags to the bottom of a large one, so that when drawn through and the large bags reversed in order to cleanse it, they appear like so many pockets attached to the bag; but when ready for use they are within the bag, their mouths opening downwards towards the bottom of the box, and are kept stretched by strings attached to their other ends and tied to loops on the sides of the large bag.

A third improvement consists in merely drawing a filtering bag once or twice within itself, and suspending the folds by loops and strings, for the purpose of presenting a larger filtering surface to the action of the syrup.

The last improvement consists in the employment of a number of small filtering bags enclosed within an outer bag, the small bags being closed except an opening at the bottom of each, which communicates by a short pipe with an opening in the outer bag, so as to permit the liquid that filters through the small bags to run to the bottom of the containing box.

The claim is, 1. To the mode of employing frames and bags as herein described.

2. To the mode of constructing and applying filter bags.

3. To the mode of constructing and applying filter bags by drawing each bag within itself.

4. To the mode of combining bag-filters herein described.

RICHARD FARGER EMMERSON, OF WALWORTH, GENTLEMAN, *for improvements in applying a coating to the surface of iron pipes and tubes.* Enrolment Office, May 3, 1841.

The coating here referred to, is tin or an alloy of tin, applied to the external or internal surface, or both, of wrought iron welded tubes, and cast iron tubes, in the following manner:—

The surface to be operated upon is first cleansed by pickling, scouring, and wash-

ing; the article is then immersed for a few minutes in a muriate of zinc, made by dissolving three ounces of zinc in a pint of muriatic acid. The surfaces are next dusted over with powdered resin, and then dipped into melted tin or an alloy of tin, as in the usual mode of tinning.

The claim is to coating of the surfaces of welded iron and cast iron tubing with tin or an alloy of tin in the manner described.

JOHN CLARKE, OF ISLINGTON, LANCASTER, PLUMBER AND GLAZIER, *for an hydraulic double action lift and force pump*, (a communication).

This double action pump consists of a working barrel fitted with a solid piston, the piston-rod working through a stuffing-box at the top; the barrel is mounted upon what the patentee terms a water chamber, but which is in fact a *valve chamber*, containing two sets of valves: the one set communicating with the lower part of the working barrel below the piston, the other set communicating by a side chamber or passage with the upper part of the barrel above the piston, so that water is raised in both the upward and downward movement of the piston.

The claim is to the invention of the said water chamber so constructed, of whatever form it may be made, and whether it is applied to pumps for mines, fire-engines, ships, or any other of the purposes for which force-pumps are ordinarily used. Also, the invention of constructing and casting the barrel of the pump and the side chamber in one piece of metal, which may be either brass, iron, or any other metal.

This patentee has been very ill advised in this matter, having re-invented and re-patented an invention for which a patent already exists, and has been in extensive use for several years. On referring to our 27th vol., at page 82, a description of Lambert's Patent Double Action Pump will be seen, which is in every way identical with that now re-patented by Mr. Clarke.

JOHN RAPSON, OF LIMEHOUSE, MILLWRIGHT, *for improvements in paddle-wheels for propelling vessels by steam or other power.* Enrolment Office, May 3, 1841.

This invention relates to applying hollow vessels to paddle-wheels in place of the float-boards or paddles now employed, whereby (it is said) in causing such hollow vessels to be immersed in the water by the rotation of the wheels, such vessels will offer greater resistance to the power of the engines, and thus cause the vessel to be propelled more advantageously; and the hollow vessels in passing the perpendicular when under the water, will by their levity tend to rise to the surface, thus requiring less of the engine power heretofore requisite for raising what is called back water.

In the drawing, five of these hollow vessels, which are formed of two copper cones united at the base, resembling in appearance a buoy, are attached to the framing of the paddle-wheel, strengthened with suitable braces, &c., so as to enter and quit the water endways.

The claim is to the mode herein described of constructing paddle-wheels by applying hollow vessels in place of the float-boards heretofore used.

HENRY HIND EDWARDS, OF NOTTINGHAM TERRACE, NEW ROAD, ENGINEER, *for improvements in evaporation.* Enrolment Office, May 5, 1841.

This invention relates to certain modes of improving the application of heat, so as to obtain greater results from a given quantity of fuel. "It will be found," says the patentee, "that when a liquid is heated up to its boiling point under the pressure of the atmosphere, steam will be emitted. If this steam is forced into a worm contained in the heated liquid from which the steam was generated: and this steam compressed till it acquires a pressure of about one-twelfth of an atmosphere greater than its pressure when occupying the space in the evaporating vessel between its cover and the surface of the heated fluid; the steam forced into the worm, will under such circumstances be entirely condensed by giving up its latent heat to the surrounding heated liquid, and that at the rate of about three pounds of condensed steam per hour for every square foot of the heating surface of the worm. The steam produced by the evaporation of the heated liquid, will thus, by its condensation, restore to the heated liquid all the caloric abstracted from it as latent heat by the steam generated, and the evaporation of the heated liquid may be thus continued, with the assistance only of the power requisite to compress the steam in the worm or other proper refrigerating apparatus, and the restitution of that quantity of caloric which may have escaped from the apparatus by leakage or radiation."

The application of this principle must of course be modified to suit the particular purpose to which it is to be applied; the patentee describes two forms of apparatus, in one of which the steam is extracted from the upper part of the boiler, and forced through a worm by a pump, the compression of the steam being regulated by a weighted escape valve; in the other arrangement, a blast of high pressure steam escaping from a small tube into an enlarged pipe, produces the like effect.

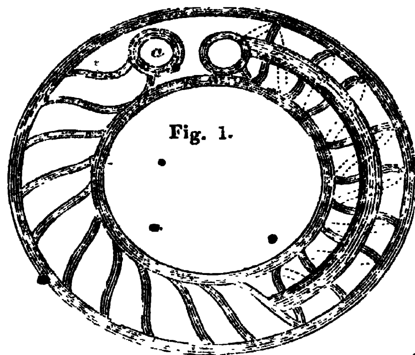
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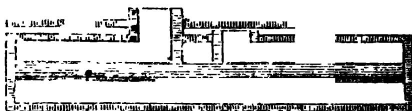
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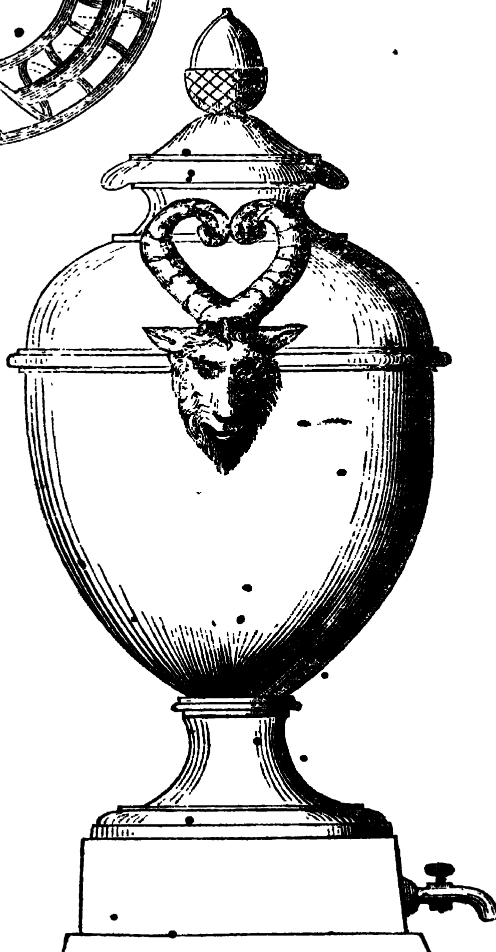
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SALT'S VASE FILTER.


Fig. 1.


Fig. 2.



SALT'S VASE FILTER.

Sir,—The subject of filters having been frequently noticed in your pages, I send you the enclosed description of one, which has been laying amongst my papers for some years, for insertion in the *Mechanics' Magazine* if you deem it suitable.

Yours most respectfully,

SAMUEL SALT.

Liverpool, May 10, 1841.

Description.

The vase herein applied as a filtering vessel, is made of clay (common or china). The mould for the vase is made in two parts lengthways, and is divided into two parts by a plate near the middle, the upper part to receive the foul water, and the lower part to receive the water when filtered.

The filterer, as above, resembles a screw in a circular form, the threads of which are covered on the outside with a casing, so that the inside represents the form of the worm of a still.

The greater part of the worm is filled with sand, and the remainder with pounded charcoal; a small piece of sponge should be placed in the mould.

The mould for the filterer is made in two parts, as shown in fig. 1 (see our front page), one part showing the top and the other the bottom. The mouth piece is shown in fig. 2; it is connected with the upper part of the vase, by passing through the plate—the other end being underneath the plate where the water discharges.

The filterer being joined together, is fixed to one half of the vase, and cemented thereto, the vase is then joined together, and it is ready (after drying) for the fire.

PERKINS'S SYSTEM OF WARMING BY HOT WATER.

Sir,—I beg to offer some observations upon the report of Messrs. Davies and Ryder of Manchester, relating to the Hot Water system patented by Mr. Perkins, and of experiments made professedly to ascertain its liability to occasion fire—but practically, I think, to discover in how short a period the improper action of fire and water, might be made to develope their destructive capabilities.

I was in hopes that some able champion of useful works, and of men who devote themselves and their property to useful inventions, would have stept forward to express better than I can do the great virtue of candour and singleness of purpose in affairs of scientific investigation, but none has appeared, and I therefore shall endeavour to do justice to an apparatus from which I have myself derived considerable advantage, and which, under fair treatment, I consider a very perfect and safe mode of distributing heat.

To effect this object, I have not to prove the excellence of Perkins's apparatus, nor to disprove the new laws of heat and radiation, which the discoveries of Messrs. Ryder and Davies have produced—volumes instead of pages might be required for the latter task. It will suffice my purpose if I can show that the merits of the hot water system in close pipes has not been investigated by Messrs. Ryder and Davies—I disclaim any thing like partizanship.

It is true, that those Gentlemen visited several buildings, in which they found furnaces and tubes which had charred wood, and combustibles most incautiously placed in contact with them, as well as others, when some accident had *well nigh* occurred; but they leave the public in utter ignorance of the cause of these occurrences. They do not say whether want of water or excess of fire, or both of these had or had not caused the evil. They do not pretend to say that the fittings they saw were fixed either by the patentee or under the inspection of an architect. They applied tests in the Natural History Museum at Manchester, but these were *unsatisfactory*, that is to say, they did no damage. So they proceeded to work in a manner which would most effectually set at naught the strength of iron, and succeeded most admirably in a private blow up. Of the nature of the means employed to produce the phenomena reported by these gentlemen we have no record—whether one or two tons of coke were employed, or whether there was or was not water in the coils; but this I believe has transpired, that the expansion tube was insufficient for the length of pipe used, and that to effect the disaster the flow was reduced from 140 to 40 feet.

Under circumstances such as I have narrated, allow me to offer to the public the form of Report, which I think Messrs. Ryder and Davies should have presented to their employers.

"That in consequence of a fire having occurred at Messrs. Craft and Stell's warehouse in Manchester, they were employed to investigate the properties of Perkins's system of hot water circulation.

"That upon giving the subject due consideration, they discovered not only new facts in the philosophy of heat and steam, but that apparatus for heating is likely to become dangerous when the furnace is placed, as was the case at Messrs. Craft and Stell's in the midst of combustibles. That in other instances, they discovered danger had occured, but whether from want of water, by ill arrangement of furnace, or gross neglect, they did not think it necessary to state. That they were perfectly aware that a very large number of public edifices, and private houses, had been effectually warmed by small pipes under the direction of eminent architects, and that no accident was recorded, but they did not think it necessary to state as much, nor to examine such, because the admission would lead them to investigate the cause instead of the effect of explosions in those cases where danger had arisen.

"That in order to prove that explosion was possible, they diligently set to work without consulting the patentee as to the amount of draught, fuel, or expansion to be allowed, and that they succeeded in boiling, igniting, melting and exploding, and finally blew up the whole concern, like the last scene in the "Miller and his Men." That crowd came round the door."

"In addition to this, they had to inform the Committee, that if mortar, dirt, or rubbish be mixed in certain proportions with the water in the coils, bursting may occur, and that at Messrs. Wood and Westhead's, of Manchester, where the trial was made, bursting by that means was effected."

"That what has happened before may happen again."

"That negligence produces danger."

Vide Report.

The above would, I think, comprise all the results of Messrs. Ryder and Davies's experiment, and be a fair statement of their exertions.

I wish for the sake of the Manchester Assurance Company these gentlemen had paid my house a visit, in which there is a furnace that heats six large offices, and passages, and staircase besides; for they might have played up all their pranks, and fired and blazed away for a week without raising the temperature to a dangerous heat. And why? Simply because the fire-box is adapted to the size of the coil and the draught is controuled by the temperature of the pipes themselves. This is Mr. Perkins's system, and Architects are fully justified in the preference they very generally give to it.

I am, Sir,
Your obedient servant,
HENRY R. ABRAHAM,
Architect and C.E.

27, Keppel-street, Russell-square, April 27, 1841.

WARMING AND HEATING—MR. PERKINS'S NEW PROCESS—DR. ARNOT'S STOVES, ETC.

Sir,—No one can be less disinclined than I am, to award to Mr. Perkins the full merits of a vigorous mind and an ingenious intellect; but "Tros Tyriusve," the truth should be told. It is with *things*, not persons, that we have to do; the former belong to our intellectual currency, the latter should be sacred and inviolable.

I remember, that when I ventured to impugn the *safety* of Perkins's "heaters," I was attacked in unmeasured terms; but the *heaters* subsequently exploded, and I presume the *invention* is laid aside. The safety of another heating affair of the same individual, has been lately controverted in Manchester, by Mr. Davies and others, touching its danger of setting fire to substances in contact, and really, when the frightful frequency of fires assails us on every hand, the public cannot be too much on their guard in cases like these.

I am not sure, that, in exchanging our open fire places for pipes and stoves, we have consulted either our individual health, or safety. I have seen paper, more than charred, even on Arnott's stoves; and it seems to be entirely forgotten, that what will merely char one thing, may ignite another, and inflame a third.

Iron, whether cast or laminated, at elevated temperatures, deteriorates the atmosphere; partly, I conceive, by appropriating its oxygen, and partly by abstracting hygrometric vapours, subsequently decomposed; nor is it unlikely that some subtile principle may evolve from its surface. Dr. Arnott's stove is ingenious, in this respect, as well

as others. Shallow trays, containing water, placed on the head of the stove seems to relieve the oppressive feeling thus occasioned, and should never be omitted.

I hold it to be an incontrovertible axiom, that the public welfare is paramount to private interest, and it is in this conviction that these remarks are made.

I am, Sir, your obedient servant,

J. MURRAY.

May 4, 1841.

CHEVERTON'S ELECTROTYPE BUSTS.

Among the novelties exhibited on Wednesday evening, at the *conversazione* given by Mr. Walker, as President of the Institution of Civil Engineers, was a small electrotype bust, by Mr. Cheverton, the artist in ivory, and reduced by him in the first instance from Chantrey's model, of Dr. Dalton. It is the united result of his peculiar art of mechanical sculpture, and the new art of electro-metallurgy. It had all the appearance of having received the highest finish which the best chasing could bestow, and yet we are assured that it had not been touched in the way of improvement since it came out of the mould, which indeed was exhibited at the same time in proof of this assertion, and in illustration of the process adopted. A bust of some destructible material being prepared, a metallic coating is formed over its surface by electro deposition, which on the removal of the inclosed mass, constitutes the mould for the electro-type bust to be deposited in, and from which it is detached by piecemeal. The preparatory process, by which the destroyed figures are produced, was not disclosed by Mr. Cheverton, but we understand that his facilities for multiplying them are such, that notwithstanding this apparently costly item in the manufacture, the electro-types may be sold at one-half the price of bronzes in general, whilst they will possess the beauty and fidelity for which his ivory copies of works of art are known to the public.

PREVENTION OF COLLISIONS ON SEA AND LAND.

Sir,—Coincidence of ideas are sometimes very remarkable. In a communication made to the Editor of the *Morning Chronicle* Newspaper, many weeks before your correspondent suggested the use of the gong in steamers at sea; I had recommended the same thing in locomotive engines on land, as the only thing that would meet the contingencies of a *fog*, when luminous signals are of no avail; and I also suggested, that by a simple mechanical contrivance, the engine itself might be made to sound the note of alarm.

I am, Sir, your most obedient servant,

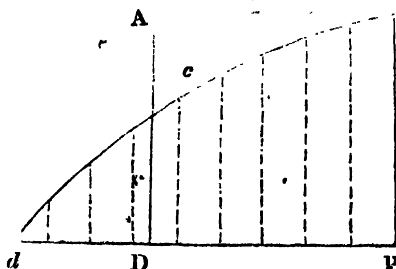
J. MURRAY.

May 10, 1841.

THE CRANK AGAIN.

Sir,—You have had so many disquisitions and dissertations, lately in your pages on the use of the crank, that I think the subject may now be fairly said to be "picked to the bone;" yet still, perhaps, you would let me endeavour to extract some of the *marrow* of what remains, chiefly for your correspondent "M.," who is evidently not yet convinced. I am sure you will always approve of an attempt to set any of your correspondents (who may be in error,) right: thereby enabling them to turn their ingenuity into some more useful channel, than trying to devise experiments to prove impossibilities. Besides, "M." has lately addressed you on the subject, giving an experiment, which he seems to think so perfectly conclusive, that really some of your scientific readers, might be misled by his confidence, and actually suppose that he had made out something of a case.

I shall first make a few remarks on the construction which Mr. Aris gave (see vol. xxxiii, page 572,) for showing the work done by the crank of a steam-engine, and which "M." found fault with, (see page 53 of this vol.,) but which appears to be perfectly correct.



"M." says that the base P d, is too long, that it should be equal to the half

stroke of the piston r P, but he should remember that it is not the work done by the *piston* that is here represented, but that done by the crank; therefore it is evident, that P d must be taken equal to the path described by the crank, while the piston is making one-half stroke, that is, equal to 90° of the revolution of the crank; as Mr. Aris says, the ordinates represent the intensity of the force available in the crank, at each point where they stand. The work done by the crank, is therefore correctly represented, by the area $r\ c\ d$ P, which is equal* to the square of $r\ p$, and it may in this way be easily compared with the work done by the piston; to represent which, we must take a base P D equal to the half stroke of the piston, that is, equal to r P. Now in this case, the available force being constant, and represented by the line r P, we have the square r P D A representing the work done. Therefore the work done by the piston is exactly equal to that done by the crank: the friction of the engine not being taken into account. So much for the *loss of force*, upon which, as a "foundation," "M." intends to "build future arguments."

Now for "M.'s" experiment. (See page 264 of this vol.). I must first state, that the facts produced by the action of his apparatus, are not sufficient for the foundation of any argument; for first, the motion of the board k with 56 lb. weight on it for 2 inches, is nothing to the purpose; it would have moved 22, had *he drawn it back* 22; and as to the 28 lb. weight moving 4 inches, the fact is, it would have moved entirely round the stop d, if the parallelism (supposed by hypothesis,) of all the lines, continued after the cross bar passed the point h; this it is evident was not the case. Taking, however, all his own facts, let us see what conclusions ought to be drawn from them. He finds that a weight of 50 lbs. at c, is just sufficient to draw 56 lbs. on k 2 inches, (the weight at c descending 2 inches), and when the cross bar comes against the stop d, he finds that the weight of 50 lbs. at c, is only able to draw a weight of 28 lbs. on k 4 inches (the weight at c descends 2 inches as before). What a loss of power is here! Half the weight is carried double the distance, and exactly the same quantity of work is done. Again, he finds that the weight of 50 lbs. is just able to move the weight of 28 lbs. 4 inches, and *then* he concludes, that it would draw a weight of 37 lbs. 6 inches!! He would not have got the board thus weighted, to move at all, but that he drew the cross bar back, so that it should come against the stop d, with an accelerated velocity, which then carried the end of the bar a little beyond the line $g\ h$.

Power is a term frequently used in the science of statics, particularly with regard to a force applied, to any of the mechanical powers; and when in any system, a power acts at a mechanical disadvantage, being by a lesser power held in equilibrio, so that no motion can ensue; it may be argued, that there is a loss of power suffered by the greater. This use of the expression, loss of power, which is not unfrequent, is however both highly objectionable and incorrect; it is greatly calculated to mislead those who dip but lightly into these matters, for if we say there is a loss of power in the lever, when by means of it a greater power, is held in equilibrio by a lesser, we must also say that there is a loss of power in the crank, when statically considered in a state of equilibrio. When, however, motion takes place, we immediately see how the matter stands; the doctrine of virtual velocities shows us that there is no loss of force whatever when the system is in motion, and therefore, that there could have been none, when it was at rest. This misapplication of the term "loss of power," combined with the fact, that the dynamical force of a steam-engine, is invariably called its "power," I conceive to be in many instances the primary cause of the error of attributing

* This may be easily proved as follows, by the differential calculus.—The equation of the curve of sines is, $y = \sin x$. Differentiating, we get $d\ y = \cos. x\ d\ x$, and $\therefore d\ x = \frac{d\ y}{\cos. x}$; also $y^2 = \sin.^2 x = r^2 - \cos.^2 x$, and $\therefore \cos. x = \sqrt{r^2 - y^2}$; hence, $d\ x = \frac{d\ y}{\sqrt{r^2 - y^2}}$. Now the area is equal to the integral of, $y\ d\ x = \int \frac{y\ d\ y}{\sqrt{r^2 - y^2}}$. Integrating, the area $= - r\ (r^3 - y^2)^{\frac{1}{2}} + C$. If area $= o$, and $c = r^2$. Substituting this value of c, we have, the area $= r\ (r - \sqrt{r^3 - y^2})$. Taking it from $x = o$, to $x = d\ p$, $d\ y = r = r\ p$; we find the area $r\ c\ d\ p = r^2$; that is equal to the square of $r\ p$.

a loss of force to the crank. If "M." should still suppose, that when there is a mechanical disadvantage, there must also be a loss of force, he may prove the contrary experimentally in a most simple manner; let a power be applied to the shorter arm of a lever, so as to act at a great mechanical disadvantage, and then let the longer arm, act on the longer arm of another lever, whose arms are proportional in length to those of the former, when the entire power will be found in operation, at the shorter arm of the latter; therefore there can be no force *lost*. Perhaps "M." will consider this self evident, and that it is not worth while trying the experiment; so much the better; an experiment exactly similar may be tried with the crank. Let him arrange a reciprocating rod, to move parallel to the piston of a steam-engine, (or to the direction of any power he applies to the crank,) and to be kept in motion by a second crank, attached to the same axle, and equal to the first in length; then let him test the force this rod moves with, and he will find it exactly equal to the force of the piston, (friction not being taken into account). If, after trying the experiment, he still thinks that there is a loss of force in the use of the crank, he must also believe, that force can be increased—in fact, created—by a crank, as well as destroyed.

I remain, Sir,

Your most obedient servant,

R. W. T.

April 13, 1841.

ON PROPELLING.—REPLY TO CAPTAIN CARPENTER BY MR. STEVENS.

Sir,—I must repeat that there were no "comparative experiments" at the Polytechnic Institution that deserved the name, much less a "series of experiments," as stated by Capt. C. The mere running the models up and down the pool at the Institution for amusement cannot properly be called "experiments," and where no calculations had been made previously as to power or the application of it. In the first place, their powers were not equal, and if they were it is well known that experiments with models amount to nothing. I had tried the screw in every form before the dates of Capt. C.'s patent and Mr. Smith's, and abandoned them as utterly fallacious, and causing a wasteful expenditure of power for little results. Would it not be monstrous to say you could propel a train of carriages on a railway by the application of the Archimedean screw, instead of the present method by the wheels of the locomotive? It is quite practicable, and why not adopt it? I have seen a clown in a pantomime proceed at a great speed across the stage, making many revolutions in his course, and he certainly did go fast, but was it not at the expense of much more power than was necessary to proceed in the ordinary way? As a propeller, the screw can never be used with economy; *it must have an excess of power to arrive at the same speed as that given by the common paddle*—and this is a position I take up and am prepared to maintain. If Capt. C. wishes this point settled to his satisfaction, a most favourable opportunity now presents itself—not, however, "with models," but with two actual steam-vessels. One is fitted with Smith's Archimedean screw, propelled by an engine of 60 horse power, a fine vessel calculated for speed which will be ready to start next week at North Shields. Not 100 yards from this vessel, lies the steam tug *Don*, fitted with my patent paddles, with an engine of 30 horse power. Now as Capt. C. is for trying experiments "without a wager," of course I cannot avail myself of betting him one hundred pounds to as many farthings, that the tug *Don* will go as fast again as the above vessel; nay, that she will tow the other astern against her 60 horse power, perhaps five or six miles per hour. But as I wish Capt. C. to think I am not joking, if he will apply to Mr. Marshall, engineer, South Shields, he will request the owners of the *Don* to run with the said boat having the screw, and I give him my word it shall be done the very first trip the screw boat makes.

It may be interesting to know that I challenged 100 steam-boats of equal power to run with the *Don*, fitted with my patent wheels; and a race accordingly took place last week, from Tynemouth Castle to Sunderland Pier. The fastest boats on the Tyne entered the lists, namely, the *British Dominion*, the *Rapid*, the *Trump*, &c. Upwards of fifty boats came out, but soon fell off, the wind blowing a perfect gale from the south east; at times the sea came over the top

of the bulwarks of the *Don*. The *Rapid* and *British Dominion* gave in after running about three miles and a half, being four or five hundred yards astern. The *Trump* only remained, and at one part of the race, getting the wind a little to assist her, nearly came up with the *Don*, but at this time, the sea being very high and the vessels steering westward to get into Sunderland Bay, brought the sea more on the beam, and the vessels began to roll; the wheels of the *Trump* were frequently out of the water, but those of the *Don*, being twice the *dip* of the others, were not once out. The *Don* won the race in gallant style; the distance run was about eight miles, which was done in fifty-five minutes, against a strong head wind and heavy sea.

I am, Sir,
Your obedient servant,
J. W. Stevens.

Woodford, Essex, May 12, 1841.

EXPERIMENT WITH MC NAUGHT'S STEAM INDICATOR APPLIED TO A LOW-PRESSURE ENGINE.—ERROR IN TEMPLETON'S RULE FOR CALCULATING THE POWER OF PULLEYS.

Sir,—In answer to Mr. Pilbrow's inquiry in the 924th number of the *Mechanics' Magazine*, I have to say that I did not notice the condenser gauge at the time I took the diagram; but this morning I took three diagrams with the indicator, and I find the average exhaustion of the cylinder to be 10.81 lbs.; the condenser 26½ inches, and the number of revolutions 38¼ per minute. Allowing 2 inches of mercury to be equal to 1 lb. I make the difference of exhaustion between the cylinder and condenser to be 2·44 lbs. per square inch.

I should have noticed Mr. Pilbrow's letter sooner, but I have been in the country, and I receive the Magazine monthly.

Allow me, Sir, to take this opportunity of noticing what I conceive to be an error in Templeton's "Millwrights' and Engineers' Pocket Companion," second edition. At page 100 and 101, the article on "The Pulley," omitting the first paragraph, runs thus, — "The advantage gained is always as twice the number of moveable pulleys, without taking any notice of the fixed pulleys necessary to compose the system of pulleys; hence, divide the weight to be raised by twice the number of moveable pulleys, and the quotient is the power required to raise the weight."

Now, I will suppose a rope, or chain, passing from a barrel over a fixed pulley at the end of a cat head—then under a moveable pulley, or snatch block—then over another fixed pulley—and then the end fixed to the moveable block; by the rule above referred to, the power would be as two to one, there being only one moveable pulley; but "personal experiment" clearly shows that the power is three to one, and as Mr. P.'s work is intended for "practical men," and "mechanics in general," I would suggest that the rule be altered when another edition is published.

Apologizing for trespassing so far on your time, I remain,

Yours respectfully,
M. Noton.

May 11, 1841.

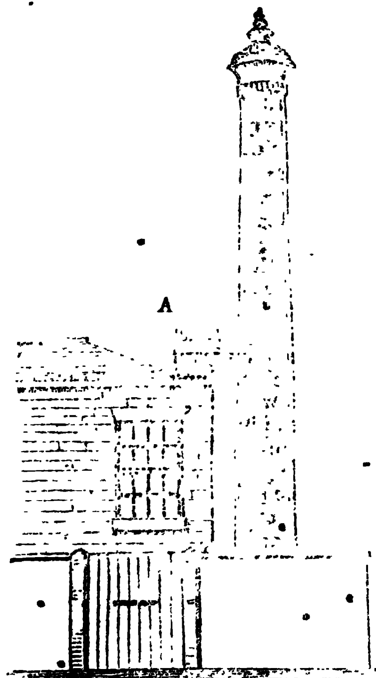
MR. R. ARMSTRONG'S PROPOSED IMPROVEMENT OF JEFFREY'S PLAN FOR CONDENSING SMOKE BY A SHOWER OF WATER.

Sir,—My attention was yesterday called to Mr. Armstrong's letter, in your excellent magazine of the 17th April, which had previously appeared in the *Liverpool Mercury*, and was replied to through the same medium, as you will perceive by the subjoined copy. Mr. A.'s prefatory remarks in transmitting you his communication are penned in a strain which nothing but disappointed hopes in a weak cause can at all palliate. His sarcasm is his most skilful weapon, and he is pretty liberal in his attempts to ridicule what he cannot controvert. The simple point in dispute is here: has he made *one* experiment, even with moderate success, with Jeffrey's long abandoned shower scheme? If he has *not*, his theorising on the efficacy of his "cask," "small pipe," and "cullender" to condense the smoke (see engraving) goes for nothing, and I very much doubt whether this economical improvement of his, situated as he proposes at the height only of the engine-house or factory, would have the desired effect. However, it is really a pity that Mr. A. does not settle the question by an actual experi-

ment, as it does not appear, on his own showing, that the cost would be very great, besides that such a proceeding is what every man having the least pretension to scientific attainments ought to adopt. I have no wish to retaliate on him in similar language to his own, in the terms he applies to the patented plan of C. W. Williams, Esq. I think Mr. Armstrong deserves every encouragement, having, I am informed, acted as agent in a number of smoke burning patent processes, and being therefore, I presume, extensively acquainted with this important subject, and I do hope that he will meet with that support to which his zeal convinces me he has a strong claim. Respectfully referring to the following letter,

I remain, Sir,
Your obedient servant,
HENRY DIRCKS.

Liverpool, Etna Foundry, May 6, 1841.



Description of Engraving.

A, a cask or cistern on the top of an engine-house; B, a small pipe connected with, C, the cullender, shown in section on the top of an internal flue made by D E, the brick partition, with an opening at D, to admit the smoke to the shower of water from the cullender above, the chimney itself being closed at the top.

SMOKE NUISANCE.

To the Editor of the Liverpool Mercury.

Sir,—I have read, in your paper of the 22nd ult., Mr. R. Armstrong's voluminous letter, in which he attempts to overturn the chemical principles carried out in the patent furnace of Chas. W. Williams, Esq. He proposes using the exploded scheme of Jeffreys, to condense smoke by a shower of water, incurring expense without offering any pecuniary return. It saves no fuel; and in towns the charge for water alone would be an insuperable objection, and the sooty stream generally a nuisance.

He paid a visit *incog.* to the Etna foundry, and only gave in his name, when asked, as he was leaving. His letter offers a tissue of gross misrepresentations in reference to the furnace there, which is not an experimental one, as he takes the liberty of asserting, but one in constant work. He is evidently not aware that the ordinary defect of furnaces, arising from admitting *too much air,* is particularly guarded against. Smoke is only consequent on imperfect combustion: the more completely combustion can be effected, just in proportion is the production of smoke diminished. This is obtained by judiciously admitting air, independent of the current of air in the ashpit. By adopting the patented method, the combustion is astonishingly perfect, the heat intense; indeed hotter even in the distant flues than has hitherto been effected by any other means, as we can ascertain, by metal bars, to which thermometers are attached. Mr. Armstrong's bold assertions, therefore, go for nothing against such decisive proofs as we can afford.

The patent furnace is so constructed that it is possible to use it on the common or on the patent principle. Externally it appears like the ordinary furnace, has a good draught, and requires rather less attention than usual from the firemen. In comparing the two methods, it has invariably been found, when used in the common way, to give less heat, more smoke, an accumulation of soot, and to be slow in getting up steam; whereas, with the same furnace in action on the patent principle, steam is obtained in considerably less time, little or no smoke made, the flues all clear and free from soot, the heat at a higher temperature in all the flues, with, consequently, an increased evaporative power in the boiler,—the saving in fuel also being very much in favour of the patent furnace. I have thus been as concise

as possible, purposely omitting all allusions to whatever in Mr. A.'s letter is merely of a personal character, the merit of which the public will readily judge, confining myself to facts, upon which alone must depend the settlement of the question,—What is the best method of abating the smoke nuisance?

I remain, Sir, your obedient servant,

HENRY DIRCKS.

Etna Foundry, Vulcan-street, April 3, 1841.

SOLUTION OF KINCLAVEN'S MATHEMATICAL QUESTION.

Sir,—I send you a solution of Kinclaven's 1st Mathematical Question proposed in No. 914 of your valuable and scientific journal.

I am, Sir, your obedient servant,

JOHN NELSON.

March 29, 1841.

Solution.

Let x = gross revenue before it was increased, and y = interest of the National Debt, then by the 3rd condition of the question $\frac{x}{1\frac{7}{9}}$ or $\frac{9x}{16}$ revenue when reduced, and by the 4th condition,

$$\frac{9x}{16} - y - 4000000, \text{ or}$$

$\frac{9x - 16y - 64000000}{16}$ = to the expence of collecting $\frac{9x}{16}$ of gross revenue, and by the last condition $\sqrt{\frac{9x}{16}} : \sqrt{x}$, or

$$\frac{3}{4} : 1 : \frac{9x - 16y - 64000000}{16} :$$

$\frac{9x - 16y - 64000000}{12}$ = expence of collecting x of gross revenue $\therefore x - y - \frac{9x - 16y - 64000000}{12}$, or

$\frac{3x + 4y + 64000000}{12}$ = available sum produced from x of gross revenue; hence, $\frac{3x + 4y + 64000000}{12} : 4000000 :: 7\frac{2}{3} : 1$, or $3x + 4y + 64000000 = 368000000 \therefore x = \frac{304000000 - 4y}{3}$.

Again, $2\frac{1}{4}x$, or $\frac{9x}{4}$ is the gross revenue when increased in the ratio of $2\frac{1}{4} : 1$; hence, $\sqrt{x} : \sqrt{\frac{9x}{4}}$, or $1 : \frac{3}{2} :: \frac{9x - 16y - 64000000}{12} :$ $\frac{27x - 48y - 192000000}{24}$ = expence of collecting $\frac{9x}{4}$ of gross revenue $\therefore \frac{9x}{4} - y - \frac{27x - 48y - 192000000}{24} = \frac{9x + 8y + 64000000}{8}$ = available sum produced from $\frac{9x}{4}$ of gross revenue.

Lastly, $\frac{9x + 8y + 64000000}{8} : \frac{3x + 4y + 64000000}{12} :: 3\frac{12}{23} : 1$, from which we obtain $x = \frac{32y + 1984000000}{45} = \frac{304000000 - 4y}{3}$, from which equation we find $y = 28000000$, and $x = \frac{304000000 - 112000000}{3} = 64000000$.

The gross revenue before the increase was £64 millions, and the interest of the National Debt £28 millions.

JOHN NELSON.

ON THE CALCULATION OF LIFE ANNUITIES.

(Continued from page 311.)

Sir,—From the short table given at the end of my last article, it appears that the gains upon the single premiums of assurance on lives of all ages from 10 to 30 (as deduced from the Northampton Table, compared with what they would be by a table exhibiting the decrements of life as observed by Mr. Morgan on good or assurable lives,) is cent. per cent.; and between the ages of 30 and 50 the gain is 67 per cent.; between 50 and 60, 40 per cent.; and lastly, between 60 and 80, 25 per cent.; from which it might be easily shown that the gains per cent. upon the annual premiums would be in a still higher ratio.

From Mr. Morgan's comparison of the mortality on single lives assured in the Equitable Society (embracing a period of 42 years, and on a body of persons not less than one hundred thousand)

and the mortality on mixed lives as given in the Northampton Table, I have calculated the following table, which exhibits the single and annual premiums for assuring £100 for a period of seven years—interest 3 per cent. 1st, Without profits to the proprietary. 2d, The said premiums increased so as to give a profit of 30 per cent. to the proprietary; and, 3rd, The average annual premiums for assuring a like sum for the same period of time from six of the London Offices. The assured not partaking of any part of the profits of the assurers.

Table II.

	Premiums without Profits to the Proprietary. Term of Assurance Seven Years.						Premiums with Profits of 30 per cent. to the Proprietary.						Average Annual Premiums of six of the London Offices.		
Ages.	Single Premium.			Annual Prem.			S. P.			A. P.			A. P.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
10	2	15	10	0	8	10	3	12	6	0	11	5	—	—	—
15	3	11	10	0	11	5	4	13	4	0	14	9	0	18	6
20	4	10	6	0	14	5	5	17	7	0	18	8	1	0	1
25	5	3	6	0	16	8	6	14	7	1	1	8	1	2	5
30	6	7	8	1	0	6	8	5	11	1	6	8	1	5	10
35	7	0	7	1	3	4	9	2	10	1	10	4	1	9	11
40	7	19	7	1	5	11	10	7	5	1	13	9	1	12	2
45	9	11	7	1	11	3	12	9	1	2	0	8	1	19	6
50	12	14	6	2	2	1	16	10	11	2	14	8	2	8	10

The average annual premiums from the above Table, between the ages of 15 and 25, produce profits much greater in proportion than what is obtained between the ages of 25 and 50. The average profit on all ages between 20 and 50 is 28 per cent. When I commenced the calculations of the above Table, I imagined that the annual and single premiums were much too high, but on finishing the subject, I am now disposed to think that the average annual premiums (with the exception of very young lives,) are not upon the whole higher than what safety demands. Contrast these premiums with the following, which shows the single and annual premiums for the same ages, period of time, and rate per cent; computed from the data of the Northampton Table of Probabilities.

Table III.

	Seven Years.							Seven Years.					
Ages.	Single Premium.			Annual Prem.			Ages.	Single Premium.			Annual Prem.		
	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
10	5	11	7	0	17	6	35	11	14	3	1	18	7
15	7	2	11	1	2	11	40	13	5	10	2	4	1
20	9	1	0	1	9	5	45	15	3	4	2	10	10
25	9	16	4	1	12	1	50	17	17	0	3	0	7
30	10	13	1	1	14	11							

High as these last premiums are, when compared with those in Table II., still they are only about the half of what the like premiums were in the Equitable

Society about the year 1773. Thus, for an age of 25 assured for 7 years, the annual premium by Table III., gives £1 12*s*. 1*d*. For the said age and period of time in 1773, the annual premium must have been £3 4*s*. 2*d*. (!) although it appears from Table II., that the said premium is only £1 1*s*. 8*d*., and then producing a profit of 30 per cent. to the Company. On this head Mr. Morgan makes the following statement: "When Dr. Price first wrote on the subject of Life Assurances, it was in general so little understood, that the application of the Equitable Society about that time for a charter was rejected by our *Law Officers* on the *ground* that their *premiums were insufficient*, although they were nearly *twice as high* as they are at present (1812.)"

I am, Mr. Editor, yours, &c.

GEORGE SCOTT,

Private Teacher of Mathematics.

21, New Church-street, Grove Road, April 10, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

**** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

PIERRE MATHEW MANNOURY, LATE OF PARIS, BUT NOW OF LEICESTER-SQUARE, MERCHANT, *for improvements in wind and stringed musical instruments*, (a communication). Enrolment Office, May 5, 1841.

This invention consists of a musical instrument, resembling a guitar in shape, capable of giving out separately, or in combination, the tones of a violin, clarionet, and violincello. These tones are produced by means of a double bellows, the wind from which acts upon a number of keys which are moved by the performer passing his fingers over a series of buttons on the handle of the instrument, which are connected with the key by cords or wires. The keys are a kind of boxes having an opening at the bottom for the admission of air, and provided with a vibrating tongue or valve at the top, which is attached by an elbow lever to one of the cords or wires. When the performer depresses a button, the cord acting on the elbow lever opens the valve, the air passing through which produces the musical tone.

GEORGE GWYNNE, OF DUKE-STREET, MANCHESTER-SQUARE, GENTLEMAN, *for improvements in the manufacture of candles, and in operating on oils and fats*. Enrolment Office, May 5, 1841.

This patent is merely an extension to the *Colonies*, of the English patent of which the specification was published at page 316, of our 33rd volume.

GEORGE DACRES PATERSON, OF TRURO, ESQUIRE, *for improvements in curvilinear turning; that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning*. Petty Bag Office, May 5, 1841.

The rest consists of a box or stand, sliding to and from the mandril, by means of an endless screw; on the front of this box a semi-cup of cast iron is fixed, in which is screwed a centre, similar to that in the back poppet of ordinary lathes, and in the centre of the semi-cup is fixed a strong iron bolt, forming the axis of a bent lever that carries the cutting tools. This lever is bent so as to describe rather more than a quarter of a circle without touching the edges of the semi-cup. From the semi-cup to the front of the rest on the side opposite the mandril, a plate of brass or iron is fixed, in which grooves are cut for the tools to work in; at the back of the bent lever is fixed a quadrant, one end of which is attached to the outer extremity of the lever, while the other end is screwed to an arm affixed to that part of the lever where it clears the semi-cup. The quadrant is actuated by an endless screw, by which the bent lever and tools are set in motion.

The second of these improvements consists in making a slide-rest self-acting, to be used for turning balls, and other descriptions of curvilinear turning. The rest differs from an ordinary slide-rest in the following points:—the tool is fixed above the rest on a small metal block, so as to work as close as possible to each centre; in order to press the tool towards its work, there is a toothed wheel which comes in contact, as it approaches either centre, with an iron bar, so placed that the pressure of the wheel against it causes the wheel and screw which is attached to it, to move slightly round, thereby urging the tool forward.

A regulating screw presses against a small cog-wheel which works into a rack; as the rest approaches the centre on either side, this rack touches a lever which shifts the driving band from the live to the dead pulley, and stops the lathe. The slide-rest is driven by gearing from the lathe mandril, which may be actuated by any suitable power.

The claim is, 1. To the rest or machine, made in the manner described and shown.

2. To the combined adaptation of the machinery herein described, for making the slide-rest self-acting.

GEORGE DELIANSON CLARK, OF NO. 198, STRAND, GENTLEMAN, *for an improved me-*

thod of preparing tallow, fats, and oils, for various uses; by purifying them, and depriving them of offensive smell, and by solidifying such as are fluid; and giving additional hardness and solidity to such as are solid; and also by a new process of separating stearine, or stearic acid, from the elaine, in such substances. (A communication). Petty Bag Office, May 5.

If the fatty matters to be acted upon are solids, they must be melted, if fluids, the heating is unnecessary; from 20 to 25 per cent. of concentrated sulphuric acid is mixed with the oil or melted fat, by agitation in a vessel of lead or wood; when well incorporated, as much nitric acid of spec. grav. 1·35, is to be added as is equal to from 1-30th to 1-20th of the sulph. acid employed; when well mixed by continued agitation the mixture is to rest for 24 hours. Water equal to half the quantity of the mixture is then added, and the agitation renewed; after standing, the acid and water is drawn off at the bottom of the vessel: and this washing is repeated until the water no longer acquires an acid taste. After all traces of the acid have been thus removed, water is stirred in until the mixture will imbibe no more, which is then put into an air-tight vessel, and subjected to the action of steam of a temperature of 277°, for at least half an hour. The mixture is then left to settle, and the water drawn off by a cock at the bottom of the vessel. When the fatty matter has been separated from the water and become clear, it is transferred to another vessel and agitated with a portion of magnesia, a weak ley of soda, or other alkaline substance, together with chloride of soda or potass, or other base, until they are ultimately blended. When the fatty matter has been deprived of its bad smell (if any), steam is again introduced, and the agitation renewed, while a quantity of the weak acid obtained from the earlier part of the process is added to remove the alkali, and the chloride, after which a larger quantity of water is added, and the mixture raised to the boiling point, and when the fatty matter has again become clear, it is drawn off into a suitable vessel, and a quantity of finely powdered oil-cake and animal charcoal added to it. In order to separate the animal charcoal and oil-cake, it is allowed to settle, and if necessary, filtered, after which it is run off into moulds, where it becomes solid on cooling, whether the original substance was oil, grease, or fat.

The mode of separating stearine, is as follows: — the oil is rapidly mixed with about ⅛th of its bulk of strong sulphuric acid, and agitated for upwards of half an hour, then left to rest for four or five hours, after which it is put into four or five times its bulk of water and well agitated; it then curdles, and separates into curds and dilute acid, when double the original quantity of water is added, and left to stand for twelve hours, when the stearine will be separated from the elaine.

The claim is 1, To the employment of a larger quantity of sulphuric acid than has been heretofore used, by means of which a chemical change is produced in the oily or fatty substances, and by such chemical change, soft fatty substances are rendered more hard and solid, and fluid oils are converted into hard fatty matters, of the consistence of tallow, and all of them are deprived of offensive smell.

2, To the employment of the chlorides of soda, or potass, or chlorides of other bases, in conjunction with the above, as another method, or as another part of the process, for disinfecting the most tainted fish oils, and fats of every denomination, and for converting them into hard substances.

3, To the employment of a higher degree of heat than boiling water, for ensuring the most perfect separation of the portion of sulphuric acid.

4, To the mode of separating the stearine from the elaine of oils and fatty matters.

Alexander Horatio Simpson, of New Palace Yard, Westminster, Gentleman, *for a machine or apparatus to be used as a moveable observatory or telegraph, and as a moveable platform in erecting, repairing, painting, or cleaning, the interior or exterior of buildings, and also as a fire escape.* (A communication.) Petty Bag Office, May 5, 1841.

This machine consists of a shaft or spar, turning in a step fixed to a foot or pediment, and supported laterally by stays. The upper end of these stays are jointed to a collar which slides on the shaft, but is retained in any required position by a pin; the lower ends fit into holes in the pediment so as to admit of the stays being placed at various angles, and thereby support the shaft in different positions. The shaft is constructed of wrought iron plates rivetted together with a sunk rack on one of the sides. A frame slides on the shaft to which is attached a gallery for workmen, &c., raised or lowered by a pinion attached to the frame and working in the rack before mentioned. An improved construction of scaffolding consists of two shafts, placed on each side of the front of a building; on the top of these shafts is a cross rail, on which is mounted a carriage, running on flanged wheels, to which are fixed two gallows suspending a light ladder by a pin or bolt. On the centre of this bolt is a pulley, over which a rope passes, one end being fastened to a gallery similar to that before mentioned, and sliding on the ladder, the other end to a counterpoise weight. On the foot of the ladder there is a roller that runs on a cross-bar for permitting the ladder to travel to and fro.

In order to bring the gallery to bear

against any part of the building, four ropes are provided, two of them being fastened to the bottom of the shafts, and passing over two pulleys at the foot of the ladder proceed up to the gallery; the other two are fastened to the top of the shafts, and pass over two pulleys on the same axle-trees as the wheels of the carriage, into the gallery. If a person in the gallery pulls the two top ropes, he raises it, or if he pulls the two bottom ropes he lowers it; or by pulling either of the side ropes the ladder and gallery will move in a horizontal direction.

The claim is 1, To the use of a shaft or spar as herein described, with a gallery or platform suspended or attached, so as to be capable of being raised or lowered on the shaft by a power, either manual or otherwise, exerted within the platform.

2, To the use of a horizontal suspension rail, supported by shafts or spars with a platform or gallery suspended therefrom, capable of receiving motion from within the gallery.

3, To the giving motion to the gallery or platform, by the application of a power, either manual or otherwise, from a point not within the gallery or platform.

ANDREW KURTZ, OF LIVERPOOL, MANUFACTURING CHEMIST, *for a certain improvement or certain improvements in the construction of furnaces*. Petty Bag Office, May 5, 1841.

The fire-place of the furnace consists of three distinct sets of fire-bars joined together so as to form the grate; the first set inclines obliquely downwards from the fire-door towards the bridge of the furnace, the second is horizontal, and the third set inclines obliquely upwards from the latter towards the bridge, thus forming a hollow grate having sufficient depth in the middle for the heating purposes of the furnace. The fire-bars are supported by transverse hollow iron bearers, having a slot on their under sides open to the ash-pit, and connected at each end to air passages in the walls of the furnace, that terminate in suitable apertures above the fire-bed in front of the bridge. The air from the ash-pit enters the hollow bearers through the slots, and becoming heated, rushes through the air passages and apertures, before described, into the furnace, when it impinges on the smoke, and effects its combustion.

The claim is, to the peculiar positions of the fire-bars, particularly their rising obliquely from the fire-door towards the bridge of the furnace, together with the hollow bearers underneath them, by which the heated air is distributed through the various air-passages in the furnace, and is caused to impinge upon the smoke over the fire-bed in an unlimited number of currents, passing through suitable apertures constructed in the furnace or fire-place in front of the bridge; and also the air-passage formed in the bridge behind the fire-bed, in furnaces constructed for marine purposes, or in such situations where a sufficient quantity of heated air cannot be introduced over the fire-bed.

GEORGE HALPIN, JUN., OF DUBLIN, CIVIL ENGINEER, *for improvements in applying air to lamps*. Enrolment Office, May 7, 1841.

These improvements consist in placing a tube within that which is usually the inner tube in the burners of Argand's lamp, and through the passage thus formed a current of air is forced, which, acting on the flame, greatly increases the intensity of combustion and the brilliancy of the light. The blast may be produced by a fan or blower worked by any suitable contrivance, or it may be supplied from a reservoir of condensed air, or in any other convenient way.

The claim is, 1. To the application of a blast or current of air (whether produced by a blower, or condensation, or otherwise) on the principle of adding a blast of air in addition to the ordinary draft of air produced by the burning of a lamp.

2. To the particular mode of applying the blast of air as a hollow cylinder, acting vertically on the inside of the flame, without causing deflection.

3. To the form and application of the separate passage for the blast or current of air through the burner, still leaving the centre space open, as in the ordinary Argand oil lamp. Also, the invention of the separate passage, whether for applying a blast of atmospheric air in its ordinary state, or mixed with gas, as for applying pure oxygen or other gas to the flame of the lamp.

CHARLES DE BERGUE, OF BLACKHEATH, GENTLEMAN, *for certain improvements in machinery for making reeds used in weaving*, (partly a communication). Enrolment Office, May 7, 1841.

The two pair of ribs into which the dents of the reeds are to be set, are passed through tubes and are held at each extremity by clamps; these tubes have at one end a hardened steel cutter, and are attached to a head-stock or carriage moving to and fro horizontally on the bed of the machine, by gearing from two treddles worked by the feet of the operator.

The pitch used in reed making is kept soft by burning charcoal during the operation, which is as follows:—the workman sits opposite the two treddles with a foot on each, and the flattened wire of which the dents are made is supplied from a coil, being first passed through a guide and between the first pair of ribs, thence through a second guide and between the second pair of ribs, where it arrives at a stop; the workman then depresses one treddle, which causes the two flyers carrying the bobbins on which the pitched bands are wound, to revolve and wind each band round the rib to which it belongs. The

workman then depresses the other treddle, imparting a rectilinear alternating motion to the tubes, by which means the wire or dent is cut off by the edge of the cutter coming in contact with the edge of the guide through which the dent was first passed. The drivers then force the dent home, along with the last coil of pitched band, and then return to their original position, for a repetition of the like process.

The claim is, 1. To the general combination and arrangement of the improvements herein described for the purpose of making reeds used in weaving.

2. To the arrangement and construction of the cutter and driver by which the dent or portion of flattened wire of which the reed is constructed, is cut off, and forced into its proper position, in a manner similar to the action of the hand-reed maker.

3. To the principle of cutting off the dents as they are set in the machine, by means of a cutter which does not revolve round the ribs; whether the cutter is formed of the edge of the driver, or by a prolonged edge of the tube.

WILLIAM CROFTS, OF RADFORD, NOTTINGHAM, MACHINE MAKER, *for certain improvements in machinery for the purpose of making figured or ornamental bobbin-net, or twist lace, and other ornamental fabrics, looped or woven.* Enrolment Office, May 7, 1841

The first part of these improvements relates to a mode of bringing a succession of pattern surfaces to act on the guide bars, and consists of a wheel with suitable notches in its periphery for receiving filling or pattern pieces, which are short round metal bars attached by strings to a continuous strap of leather. These pattern pieces are brought in succession into the notches in the wheel, and thus operate upon the guide bars.

The second improvement consists in the employment of a peculiar construction of independent instruments to act as interceptors of warp-threads in bobbin-net lace machinery, the stems of which being formed of springs renders the use of separate springs unnecessary.

The third improvement relates to the use of perforated metal plates to work the guide-bars; the perforated plates are connected together by an endless chain, and by the revolution of a Jacquard cylinder are brought under a series of cranked levers that actuate the guide-bars.

The fourth improvement consists in the employment of an extra point-bar, to keep the warp-threads open during the swing of the carriages through them, so that the warp-threads below the point-bar may be racked and selected during the movement of the carriages; the extra points holding the warp-threads from changing, while there are changes taking place below them. The last improvement consists in making each of the pillars of the lace of three warp-threads interlaced by a bobbin-thread.

The claim is, 1. To the mode of constructing and applying pattern surfaces and wheels as herein described.

2. To the mode of constructing spring-stemmed interceptors.

3. To the mode of applying Jacquard or perforated surfaces to the guide-bars of bobbin-net lace machinery.

4. To the mode of applying an extra point-bar to the warp-threads, in order to their being held for the carriages to pass through, and thus allow of the warp-threads being racked, when such application is made to bobbin-net lace machinery, wherein the warp-threads are worked by independent instruments.

5. To the mode of making lace and other fabrics in bobbin-net or twist-lace machinery, by causing each bobbin-thread to interloop or weave with three warp-threads in making the pillars of the meshes.

EDWARD DODD, OF GLOUCESTER-PLACE, MUSICAL INSTRUMENT MAKER, *for improvements in piano fortes.* Enrolment Office, May 7, 1841.

On the top rail of upright piano fortes, the turning and other pins are fastened back and front; beneath the lower rail a number of pulleys are mounted on suitable axes. One end of each string is fastened to a front pin on the top rail, from whence it descends and passing round one of the pulleys beneath the lower rail is carried up and fastened to one of the back pins, by which means the strain on both sides the frame is equalized.

The claim is, to the mode of applying strings to piano fortes, whereby the strain thereof is rendered equal, or nearly so, on both sides of the frame.

GEORGE EDMUND DONISTHORPE, OF LEICESTER, MACHINE MAKER, *for certain improvements in machinery, or apparatus for combing and preparing wool and other textile substances.* Petty Bag Office, May 7, 1841.

The first improvement is upon the machinery patented by the present patentee, and another in 1835, and consists in a new method of moving the combs. The holding combs are moved vertically by a cam on the main axis; the other sets of combs are moved horizontally by two levers to the upper ends of which they are attached, the lower ends of these levers being attached to horizontal axes at the lower part of the machine. There is a stud on the centre of each lever which works in the grooves of two cams on the main axis, which communicates the required motion to the combs.

The second improvement consists in giving a vertical alternating motion to the holding combs, by attaching a horizontal lever at one end to the framing of the machine, having a roller near its centre which traverses the sur-

pillars of the face of a cam on the main axis; on the outer end of this lever the roller of the shaft that carries the holding combs travels, which by the rotation of the cam is moved up and down. The other sets of combs have, in this case, a rotary motion.

The third improvement consists in heating the combs, by dipping them into a vessel of hot water, soap and water, or other hot fluid, before placing them in the machine.

The claim is to the improved arrangements and construction of machinery for combing and preparing wool and other textile materials, to which such machinery or apparatus may be applicable, and particularly the application, and one of the cams and eccentrics, and the mechanical agent for giving the required motion to the combs, and giving to the holding combs the required movements, in respect to the rotary motion of the other set of combs, so as to bring the wool or other material gradually under the operation. And, lastly, the application, and use of hot fluids, as the heating medium for heating the combs in wool-combing machines, or those used for other textile substances.

JOSHUA SHAW, OF GOSWELL-STREET-ROAD, ARTIST, *for certain improvements in discharging ordnance, muskets, fowling-pieces, and other fire-arms.* Rolls Chapel Office, April 29, 1841.

These improvements are tolerably well explained in the claim, which is as follows:—

"I claim firstly, the discharge of fire-arms by placing a percussion cap on the end of a cylindrical piston or rod formed for the purpose; such piston with its cap being made to pass through an opening adapted thereto, either in the body of the breech of the piece to be discharged, or through tubular pieces screwed into, or otherwise attached thereto; the said piston being of such length as shall adapt it to the respective modifications of my apparatus, as described, that is to say:—I claim the passing of such a piston through a tubular opening, allowing it to reach across the chamber, as in my first described modification. Or, I pass it into a cylindrical opening extending nearly to the chamber, when a shoulder is formed by diminishing the size of the aperture, in the manner and for the purpose set forth; the respective parts concerned in the discharges being constructed and operating substantially, as herein fully made known. I claim, likewise, the improvements in the percussion cap, consisting of the perforation through the middle of what is usually its closed end, in the manner and for the purpose described. And, secondly, I claim the method of applying, adapting, or containing the detonating powder in a recess formed at the lower end of the piston, in which the slender edge or rim inclosing the fulminating powder is made so thin that on receiving the blow of the cock it swedges upwards, and progressively giving way as the matter becomes ignited, driving all the fire before it into the chamber of the gun, allowing none of it to escape, by which means any accumulation of dirt or rust about the lock or breech is entirely prevented, insuring quickness and safety, at the same time the fire being generated within the sixteenth of an inch of the magazine, and upon a level with it. And I also claim as new and useful the nut or priming-tube, made to receive and to secure the primer containing the detonating powder in its proper place, and from the effects of rain or moisture, as set forth and described. But more especially do I claim as my invention the priming cap constructed to operate in the way stated, and acting in combination with the priming nut or tube."

EUGENIUS BIRCH, OF CANNON ROW, WESTMINSTER, CIVIL ENGINEER, *for improvements applicable to railroads, and to the engines and carriages to be worked thereon.* Enrolment Office, May 11, 1841.

These improvements are for the most part identically the same as those previously patented by Mr. Pettit, and fully described in our 924 number.

The claim is 1, To the mode of regulating and cutting off the steam of locomotive engines, by applying apparatus to railways to act on apparatus in connection with a valve when the same are brought into action by the travelling of the locomotive engine on a railway, and without depending on a person or persons travelling with such engines.

2, To the mode of applying breaks to the wheels of railway engines and carriages by applying apparatus to a railway and to railway engines or carriages in such a manner as to be brought into use by the travelling of the engines or carriages on the railway, and without depending on a person or persons travelling with such engines or carriages.

3, To the mode of sounding a whistle by applying apparatus to a railway and to railway engines in such a manner as to be brought into use by the travelling of the engines on the railway, without depending on a person or persons travelling with such engines.

4, To the mode of showing a light by applying apparatus to a railway and to railway engines, in such a manner as to be brought into use by the travelling of the engines on the railway, without depending on a person or persons travelling with such engines.

5, To the mode of applying breaks, whereby two pair of wheels are caused to move in opposite directions as described.

ALEXANDER JONES, OF KING-STREET, ENGINEER, *for improvements in the manufacture of copper tubes and vessels.* Enrolment Office, May 11, 1841.

This patent for a practical application of the modern discovery of Electrography to

manufacturing purposes, by the production of tubes and vessels of all kinds in copper deposited by the voltaic agency. Moulds of wood, clay, earthenware, plaster of Paris, wax, or other non-conducting substances, are formed and coated with some conducting material in the usual manner; or the moulds are made of lead or other metal more fusible than copper. The mould is placed in a solution of nitrate or sulphate of copper and surrounded with a larger cylinder of sheet copper, or of copper turnings enclosed in wicker. The mould is then connected by a wire with the positive end of a galvanic battery, and the surrounding copper with the opposite end, when the operation goes on for five or six days, at the end of which the article will be completed. The patentee also adapts a similar method for uniting the parts of metal articles together; the part not to be acted upon being protected by any of the resinous varnishes.

The claim is, to the manufacturing of copper tubes, and also of vessels, such as urns, covers, kettles, stew-pans, and the like, of the usual substance of such copper articles, wholly from copper, deposited or thrown down by the action of voltaic or galvanic electricity, as hereinbefore described, upon moulds; such moulds not forming any part of the said manufactured article when complete, but melted out or otherwise, according to the nature of the mould, when the copper tube or vessel is complete. And also, the making of joints or joinings, as hereinbefore described, by means of which improvement in the manufacture of copper-tubes or vessels, I can form tubes or vessels in one piece which heretofore were necessarily made in several pieces—can secure a more even and uniform texture of metal, and can join pieces or parts together without the aid of other metals as solder, and without the practice of soldering, or the application of heat for that purpose.

John Heaton, of Preston, Overlooker, *for improvements in dressing yarns of linen or cotton, or both, to be woven into various sorts of cloth.* Enrolment Office, May 12, 1841.

This invention consists, firstly, in warming the air, by which the yarn, when wet, with the paste sow or size, is to be dried, in an apartment distinct from the dressing-room.

Secondly, In passing a current of the air so warmed through that portion only of the yarn which is ready to be dried, and in quantity, and of a temperature sufficient to dry it and to complete the dressing, after the application of the paste sow or size, and after the operation of brushing.

Thirdly, In shutting off the said current of heated air from the yarn at the pleasure of the operator; and, lastly, in forcing out of the dressing-room the damp air generated by the drying process. The dressing machine is of the ordinary description, furnished with beams at either end, upon which the yarn is wound, and from which it passes off between guides and between the sow or dressing rollers, the lowermost of which dips into the paste sow or size contained in a trough. After the yarn has been wet by the paste sow, and the fibres of every thread brushed, so as to lay close upon it, the yarn passes through reeds and over two wooden boxes which conduct the heated air from two valves. The air is heated by passing over an arrangement of steam pipes, and is driven into the wooden boxes by revolving fans, passing through valves which are kept open by weights when the machine is at work, but closed by the stopping of the machine, by levers acted upon by the apparatus for shifting the straps from the line to the dead pulley. The humid and warm air is permitted to escape through apertures or ventilators provided for the purpose, in the roof and side of the dressing-room.

The claim is to the heating of air in a chamber, care or compartment, apart from the dressing-room, and creating a current of that heated air, and forcing and directing that current of air so heated, through that por tion of the wet yarn requiring the same air in the process of dressing, in such a manner as to dry the said portion of yarn while the heat in the dressing-room is less oppressive to the operators than it is in the method or methods of drying yarn followed before this invention; and also so as to force the air created thereby out of the dressing-room through ventilators arranged for the purpose; and wheen needful or expedient, stopping the supply of heated air.

John Annes, of Plymouth, Painter, *for a new and improved method of making paint from materials not before used for that purpose.* Enrolment Office, May 14, 1841.

This invention consists in making paint from the following materials, viz.: The sulphurets of copper, lead and antimony, iron pyrites or mundic, granite, gneis, the elvan stone, felspar and quartz, by combining one or more of them in the following manner: 2 gallons of water, 8 oz. of sugar of lead, 8 oz. of blue vitriol, 8 oz. of green vitriol, 8 oz. of white vitriol, and 24 ounces of alum are mixed together. One hundred weight of one or more of the first named substances in an impalpable powder are mixed with as much of the foregoing composition as will bring the mass to the state of a thick paste, it is then levigated with 2½ gallons of linseed oil, and the required tint added.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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BERNEY'S IMPROVED SPRING GUN-STOCK.

BERNEY'S IMPROVED SPRING GUN-STOCK.

Registered pursuant to Act of Parliament, May 21, 1841.

The engravings on our front page represent an improved Spring Gun Stock recently registered by Thomas Trench Berney, Esq., of Morton Hall, Norfolk, patentee of the improved cartridges, the successful performances of which we have noticed on two former occasions.

The object of the present contrivance is to reduce the unpleasant effects of the recoil in fire arms, and the accomplishment of this, in the larger species of guns especially, promises many important advantages. The application of the spring gun-stock to the swivel guns employed in the naval service, and those fired from the backs of horses, camels or elephants, as is common in Eastern warfare, as also their adaptation to boat guns for sporting purposes, seems to offer an easy and certain remedy for many of the inconveniences hitherto inseparable from these weapons in their ordinary form.

The manner in which the ingenious inventor has effected the object he had in view will be seen on reference to the prefixed engravings, of which—

Fig. 1 is the gun complete. A is what is called a guide iron; B, an additional handle, or butt piece, which may be of any approved length. When the gun is fired (from a post or a horse), B is held firmly under the right arm, while the left grasps the round part of the guide iron at F, and the right hand pulls the trigger string T, which passes through a hole in the butt C, as shown by the dotted line. When fired, the spring yields to the force of the powder, and the butt slides back on the guide iron A, to which it is attached only by the pin or bolt H, which passes through the mortise or slit in the guide iron without the slightest jar or recoil to the party firing. D (fig. 1), is the standard, or stancheon iron, which turns in a hole in the post, which hole should be lined, turned up, and bored out to fit the stancheon; it should have a collar at its upper end for the bearing of the stancheon to rest on, as the force of a heavy gun will soon gall the hole in the post.

Fig. 2, A, is the guide iron; E, the screwed hole which unites the spring, the guide iron, and stancheon together. A is the mortise, or slit through which the bolt H passes (see fig. 1), which *mortise must be perfectly parallel with the bore of the gun.* The guide iron A, is flat, 2 inches by ½ or ⅝ths of an inch (see fig. 3); it is forged round for the convenience of holding when fired, and for the handle B to screw into. The handle B is of wood 2 inches diameter; at the end into which the screw spike is fixed, it is planed flat to 1 inch thick; at the other end, an iron collar, or ferule is put on the round end of the handle B, to prevent the spike splitting the wood.

Fig. 3, A, is the guide iron seen edgeways; F, the jaws and screw-bolt; E, the round end, or handle into which B screws.

Fig. 4 and 5 show the butt in different positions, to explain the mortise or groove G, which slides along the guide iron when the gun is fired.

Fig. 5 shows the screw bolt H, and the mortise in which the guide iron goes.

Fig. 6, The spring. Note that the butt must be balanced with lead or iron, so that the butt end may be 6 or 8 pounds the heaviest.

Fig. 7 is a gun made as recommended by the inventor, with a straight stock,—in which case the guide iron may be bent as much as desired; so that a person may have a bent handle or stock to shoot with from a post or a horse, and a straight one to use in a boat.

LIFE AND LABOURS OF TELFORD.

NO. IX.

[Continued from page 375.]

Scottish Harbours. The Tay Steam Ferries.

Among the most useful and important, if not the most brilliant works of Telford, may be ranked the numerous improvements effected under his direction in the harbours of Scotland, of which Aberdeen and Dundee, both on the eastern coast, were the principal, and may be taken as knights of the shire, representing the whole class.

The harbour of Aberdeen formerly consisted of nothing more than the mouth of the River Dee, which was rendered peculiarly unsuited to the purposes of commerce by its shallowness, as well as by the existence of a bar of sand across its entrance. About the middle of last

century, when the shipping of the port required better accommodation, the citizens applied to the celebrated Smeaton, but the funds placed at his disposal were so scanty as to justify nothing further than the formation of a tidal harbour, which was finished in 1783. The trade continuing to increase, in 1794, Sir John, then Mr. Rennie, was called in, who produced a plan for a series of docks on the sands called Foot-Dee, which, fortunately as it happened, was never carried into execution. At the beginning of the present century, Telford, being employed by the government of the day on a general survey of the Scottish coast, was requested, when on the spot, to make a plan for the improvement of the harbour of Aberdeen. The project he matured in consequence was, to place a lock across the channel of the river, to dig large excavations to serve as floating-docks, and to make use of the earth thus obtained for an embankment. A mound was to be raised to divide the dock into two basins; forty acres were to be devoted to ship building, leaving the whole space of the Foot-Dee for the requirements of commerce. The water coming down the river he proposed to apply to the moving of the sea channel, and the old piers he designed to carry out to a far greater extent than before.

Although the plan for these improvements was ready in 1801, it was not till 1810, owing to local disputes, that an Act was obtained for their execution. After that period the works proceeded rapidly, under the immediate direction of a resident engineer, Mr. John Gibb, but also under the final superintendence of Telford. The expense amounted to 160,000*l*., and, since the works have been completed, the trade of Aberdeen has undergone a very material increase, though hardly to so wonderful an extent as in the next instance.

Dundee is situated on the North side of the River Tay, there two miles wide. Until the opening of the present century, in consequence of the excellence of the roadstead, there was but little wharfage, notwithstanding the accommodation required by the great hemp and linen manufacture of the town, as well as by those fruitful corn districts, Strathmore and the far-famed Carse of Gowrie. At the end of the war, however, the transport service, which had employed many of the ships, fell to nothing, and the merchants were "too far North" not to perceive that they must look for employment farther afield. For this purpose ships of larger size were required, and a corresponding increase of accommodation. At first, the narrow-minded views of the old corporation were a great stumbling-block, but their opposition being luckily overpowered, more liberal ideas prevailed, and a plan was soon formed for making a floating dock on a large scale, with a graving dock attached, and proper entrance piers. It was also determined to deepen and enlarge the harbour, and with so much energy and perseverance were proceedings carried on, that in the ten years from 1815 to 1825, all these great objects were effected with the most perfect success. The increase in the trade of the port more than justified what some had considered the rashness of the projectors; it was so rapid, indeed, that in 1810 it had become necessary to apply to Parliament to obtain an Act for the erection of new and extensive docks in addition to those so recently completed.

The floating-dock is 750 feet in length, and 450 feet wide, with an entrance-lock 170 feet by 40. The dimensions of the graving-dock are 265 by 40 feet (60 feet at the top), and the depth of water is most ample, being 16 feet in the sill of the lock. The expense of all the alterations amounted to 120,000*l*., but as the annual dues in 1810 reached the sum of 11,645*l*., it cannot be said that such an expenditure was uncalled for. The effect of these improvements, and of the enterprising character of the people of Dundee has been, in all points of view, most amazing. While in 1799, the shipping of the port amounted to 63,519 tons; in 1810 it had actually increased to 150,915 tons, or considerably more than double! Before 1815, the greatest import of flax and hemp in any one year had been 300 tons; in 1830, it was no less than 18,557 tons! To such an extent had the staple manufacture of Dundee and its vicinity spread during the progress of the docks, that, in the year ending May, 1831, there were shipped at the port 356,817 pieces of linen, measuring the enormous length of *fifty millions* of yards! Besides these, there were shipped also 85,522 pieces, or three million yards and a half of sail-cloth, and 62,199 pieces, or four mil-

lion yards of bagging, making a grand total of *fifty-seven and a half* millions of yards! The value of the hemp and flax imported during the same year was seven hundred thousand pounds, and that of the finished goods shipped for exportation, one million five hundred thousand pounds. The chief trade of Dundee is with the United States, with British America, and the West Indies, to the commerce with all which places the new docks offer the most important, and indeed indispensable facilities, It may be added to the rest of the statistical details, that the population of the town, which in 1801, was 26,804, had increased in 1831, to 45,355, and it is estimated now at considerably above 60,000, the prosperity of the place continuing to increase, in spite of the croakings of those (not a few) who took part with the old corporation when, the improvements now so triumphantly successful were originally projected.

Besides Aberdeen and Dundee, there were numerous smaller harbours in Scotland where improvements of a minor character were planned and perfected by Telford. The expense of most of these was borne out of what were termed the "forfeited estates." The estates of those unfortunate adherents of Charles Edward who were "out in the '45," were of course declared forfeited, and in 1752, were vested by Act of Parliament in the Crown, "for civilizing and improving the Highlands of Scotland." In 1784, however, this Act was repealed, and the various properties were re-granted to the descendants of their former owners, on certain conditions, one of which was, that they should repay the incumbrances which had, since the forfeiture, been provided for out of the accruing rents. This amounted to the sum of 90,000*l*., but when, during the progress of the Highland Roads and Bridges, a Committee of the House of Commons was appointed to investigate the matter, it appeared that the principal part of this sum had been laid out for various public purposes, so that 13,000*l*. only in ready cash remained, which it was resolved to turn over to the Commissioners of Highland Roads, to be by them applied to the improvement of the minor Scottish harbours. At the end of the war, however, the City of Edinburgh paid off a debt which they had incurred to the fund, so that the commissioners were from that time enabled to proceed, under the guidance of Telford, with greater liberality and spirit.

The usual way with the Commissioners was, to advance one-half of the capital required, on the townsmen finding the other half from their own funds. In this manner the harbour of Peterhead was materially improved, at an outlay of 30,000*l*. (altogether), and that of Bamff at an expense of 16,000*l*. On the whole, the Commissioners continued by a careful expenditure of about 50,000*l*., under their controul, to cause the completion of works in various places to the amount of 110,000*l*. By this means the second and third-rate harbours of Scotland were put much nearer, comparatively, on a footing with their more aspiring neighbours than they could possibly have been if left to their own resources; nor can it be complained that the public money was expended with any great profusion in these useful undertakings.

In 1834, all the funds from this source were exhausted, the Commissioners having been disappointed in the receipt of a sum of 25,000*l*. owing by the Crinan Canal, the proprietors of which, were, in fact, so little able to pay, that they could not even keep the canal in repair; so that the Legislature was finally compelled, not only to give up the demand, but to expend 20,000*l*. more in order to prevent the danger which would have resulted to fishing craft and other vessels from the neglected state of the works. This sum was expended in 1817, under Telford's superintendence.

The steam-ferries of the Tay are so closely connected with the Dundee improvements, that a notice of them in the same paper will be perfectly in place. In going from Edinburgh to towns on the east coast of Scotland, it is highly desirable to proceed in a straight line through the county of Fife to Dundee, by which, instead of going round by Queensferry, a saving of 25 miles is effected. There are, however, two great obstacles in the way in the shape of ferries, one of which is seven miles, and the other two miles across. By adopting the agency of steam, and erecting landing piers, however, all objections to these passages are now effectually removed.

After many other projects had been rejected, Telford's plan for erecting ferry-

piers was determined upon. From each of these a steam ferry-boat starts every half hour. The Messrs. Carmichael, well-known Engineers of Dundee, constructed these on a most ingenious plan; the boats were built double—twin boats as they are called—and the paddle-wheel placed in the middle, instead of at the sides,—a plan which has been found to answer the purpose perfectly. Each of these boats carries an engine of 30 horse power, and being 92 feet long and 34 feet wide, there is ample room for carriages to enter and depart, if need be without their driver or passengers alighting, for which purpose there is a platform at each pier. The landing place on the north is 150 yards in length, and on this, besides a parapet and foot path, there is a paved way for carts and coaches. The expense of the works (which are turned to account also in the protection of the shipping in the harbour,) amounted to 24,000*l*.

There are three steamers on the station, one of which starts from Dundee every hour. The passage across occupies from 18 to 25 minutes, according to the state of wind and tide.

The public appreciation of the convenience of this ferry may be judged of from the fact, that the fares have increased from 2,747*l*. before the improvements to 4,936*l*. This was in 1810, and the further increase since that date must have been considerable.

ROTARY ENGINES—THEORY AND PRACTICE.

Sir,—In the article, taken from the *Encyclopædia Britannica*, on "Rotary and Reciprocating Engines, &c.," it is stated that "there is a radical fault inherent in the very nature of rotary mechanism, from which it follows, that the rotary engine can never be, either economical or durable. This alleged fault is said to be, that the rotary piston is *necessarily* subject to unequal friction: viz. friction increasing from centre to circumference. Now it is rather singular, that in the very number (913) in which the first part of the paper is contained, is an account of a rotary engine, that of Messrs. Corde and Locke, entirely free from this particular kind of friction. The *sides* of the revolving wheel, "*conform* to the circumference of the case, but do not touch it," and the only friction in this part of the engine, is between the outer circumference of the flanges, or rims, of the revolving wheel, and the inner circumference of the last, and between the latter and the outer edges of the vanes. It is clear, therefore, that this objection to rotary engines does not apply to the one in question. This would only show one theoretical error in the paper, but the success of Craig's engine, described in your 919 number, proves how completely the very talented writer was in error in his judgment of the rotary engine, and adds another to the many previous evidences that theoretical objections are worthy of little regard in practical science.

It may not be uninteresting to enumerate *a few* of the mistakes of this kind committed by talented theoretical men in the last few years. In a number of the *Quarterly Review*, which was published whilst the Liverpool and Manchester Railway was in progress of construction, it was seriously proposed to limit, by Act, the speed to eight miles the hour, and the idea of going regularly and safely 20 miles in the same time was ridiculed. In the *Encyclopædia Metropolitana*, published in 1836, in the vol. on manufactures, by P. Barlow, Esq., F.R.S., it is stated, that the recoil water mill *cannot* be employed with advantage—that a little more than half the power of the water is all that can be obtained, and that it would not be worth notice were it not that attempts were making to construct steam engines on the same principle; and yet a few years have witnessed the success of Stirratt and Whitelaw's Water Mill, and Craig's Steam Engine, both on this principle. In the same paper the possibility of obtaining a useful speed of more than four miles an hour upon canals is doubted, if not actually denied; and yet nine to ten miles the hour is daily performed at the present time with ease and utility, and experiment has shown, that by means of a locomotive, twenty miles is practicable. Had not accidents discovered the inapplicability of the old theory of resistance to floating bodies to high velocities, we might have been for years deprived of a very useful and cheap means of locomotion. The error of Dr. Lardner is too well known to require repeating, and it would tire the patience of your readers

to go on with this list. Enough has been already said to encourage practical men not to place too great confidence in the opinions of theorists, however talented or unprejudiced they may be, or however plausible their objections to a new invention may appear.

I remain, Sir,

Yours respectfully,

O. Y.

Hammersmith, May 3, 1841.

DR. PATRICK GILLESPIE'S PRACTICAL TRISECTIONS OF PLANE ANGLES.

Sir,—In No. 916, page 185 of your valuable Magazine, I find an article entitled "Practical Trisections of Plane Angles," by Dr. Patrick Gillespie; who, after stating *two* cases of *practical* trisections, thus concludes his communication: "The *demonstrations* of these trisections I *leave* to your readers, as it might occupy more space than you can spare."

Now with all due deference to the dignity of the worthy Doctor, I cannot conceal my conviction that either he must be deficient in information and unaware of the strictness of *demonstration;* or that the terms "Practical Trisections" are intended as a *pun* upon the words, and literally signify *practically impracticable.*

The problem of the trisection of an angle is ascribed to the responses of the Delphian Oracle, and its solution has frequently called forth the powers of the most able mathematicians both of ancient and modern times.

The principles, however, involved in the problem were found to transcend the limits of elementary construction, and their investigations, though they failed in determining the problem, yet led to the discovery of some of the higher curves, and essentially contributed to the extension of geometrical analysis. In order to *construct* the problem Nicomedes proposed the *conchoid,* and an elegant solution is given by Newton in his "Universal Arithmetic" by means of an hyperbola, whose asymptotes form an angle of 120°. Professor Leslie has summed up and beautifully analysed the conditions requisite in his "Geometrical Analysis," Book I, Prop. xxv, by several different methods; and instead of attempting a solution in which so many had so signally failed, thus expresses his opinion:—"such then are the final conditions on which the trisection of an angle is made to depend; but to fulfil them in general *exceeds* the powers of elementary geometry."

Returning to Dr. Gillespie's figure, I find that his *practical* trisections consist in drawing "C E F meeting the diameter extended at F, so that E F shall be equal to B A or B C," and this is the identical *requisite* deduced by Leslie, on doing which the whole difficulty of the solution depends. If Dr. Gillespie can *demonstrate* and show how this line can be drawn *practically* and *geometrically* (for I doubt the capability of any of your readers,) he has achieved a noble triumph in geometrical science, and for the demonstration of which, I am sure you would have no objection to devote a page of your valuable journal.

Hoping you will give insertion to this, and expecting to see these demonstrations in an early number,

I am, Sir, yours respectfully,

SCHOLASTICUS.

Habergham Eaves, Lancashire, April 22, 1841.

PROFESSOR MURRAY'S SHOWER BATH.

Sir,—The public, I presume, are not generally aware to whom they are originally indebted for a little nursery and shower bath, to be found now in almost every ironmonger's shop.

That invention I described fifteen years ago, along with the principle applied on a larger scale, to a shower bath of the usual magnitude, in a pamphlet descriptive of the invention; as well as that of an instrument for inflating the lungs, in cases of suspended animation.

The principle in question is extremely simple. The mere pressure of the finger opens a valve, when the vessel is replenished by immersion; the pre-contained air being thus expelled. When the valve is closed, the resisting atmosphere maintains the supply of water, which descends in a shower, intermitting or prolonged, by the management of the valve. I also recommended this as an elegant substitute for the watering-pan, and called it an *Aquarian.* It is figured in Mr. Loudon's works

I am, Sir, &c.

J. MURRAY.

May 1, 1841.

RATIONAL PHILOSOPHY.—LETTER III.
MATTER.

The substance of which all lesser bodies, and of the earth itself, are constituted, is named *matter*. Hence, everything terrestrial is material. But only to the elementary, or uncombined state, does the term *matter* correctly apply. As terms, *matter* and *elementary* should be considered synonymous. The combined state of elementary matter is recognised as *body*. The precision of science requires this distinction of terms, and in support of first principles it will be found not only advantageous but essential.

Matter consists of atoms or molecules, which is made manifest in all manner of bodies being, by one means or other, convertible into air, the constituent substances of which are atoms.

That the atoms of matter are unalterable in substance, essence, and form, is a fundamental principle in physical philosophy.

Matter is naturally and essentially *inert*. This is evident by there being no such thing in nature as a self-moving body. Could atoms act individually they would collectively; that they cannot act at all is evident by the quiescent state of all parts of a stone on the ground.

The substance of matter is homogeneous throughout; inasmuch, as where ability to act is wanted, all difference of essence would be useless. On this principle only it is that dissimilar bodies yield similar gaseous products, and that the atmosphere supplies and receives back the whole of the atomic substance of bodies.

Matter being unalterable its atoms are not divisible; there is nothing divisible but *body*.

Matter being homogeneous and of inactive essence, no essential difference exists among bodies; nor are the changes to which bodies are subject produced by any but mechanical agency. Essential alteration of bodies is as impossible as of atoms.

No combination whatever of atoms can originate an *essential* quality.

The *spherical shape* is common to all the atoms of matter; on which depends both the porosity and expansion of a body being uniform throughout.

There is nothing to constitute an *element* but the collection of the same sized atoms.

Matter can suffer no change whatever but change of place; nor bodies but increase, decrease, and intermixture of their atoms—and motion through space.

Inertia of matter is the fundamental basis of the philosophy of mechanical nature.

Here it is that true philosophy has its certain beginning. Having divested matter of the host of factitious qualities and properties of the chemical *art*, such as *luminousness, light, volume, sound, heat, cold, flavour, acidity,* and *odour*, the whole of which are but sense excited mental effects—also of *attraction, repulsion,* and *self-gravitation*, which are as foreign to brute, inanimate, inert matter as though there remain nothing on which to reason and philosophise, but, unknown inert matter in a state of constant local change, and the *cause* of local transfer; which latter it is the province of reason to deduce from the existing general state of things and the inactive nature of matter. The whole of human knowledge being intellectual, *we know nothing*, immediately, *but our knowledge.* Motion being effect universally, the whole of philosophy consists in the *science of cause*. Such were the opinions of Aristotle, and they are uncontradictory.

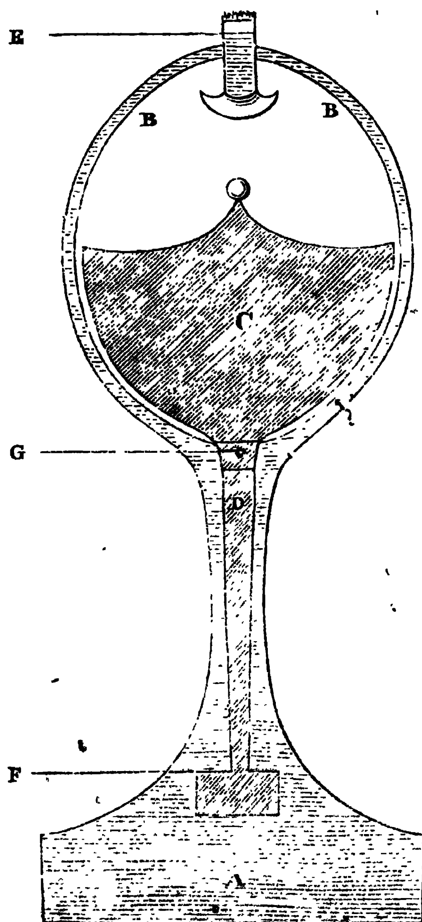
The Baconian advice, to torture nature out of her secrets by *experiment* and *observation*, has hitherto, and ever must fail of its vainly imagined object. She has been tortured from the dawn of science, and submitted to the *experimentum crucis* without once making confession of cause. By which modern philosophy has no universal cause, but what needs auxiliary assistance. Even *inertia*, which is nothing, therefore productive of no effect, is one of its numerous causes; and as to "observation," how little is it imagined that externals do not come under observation, or, that nothing whatever of all they make us know belongs to them. Experiment is highly useful in the arts, but the natural procedure, the *modus operandi*, imagined to be discoverable by observation, is guess work in every instance, and stands self-proved to be such, by every result admitting of being accounted for on different and opposite principles, equally in the shop of the artizan and laboratory of the philosopher. It is not—as proved by ages—from "ex-

periment" and "observation" the theory of nature is discoverable, that the adoption of correct first principles, such as those of *perception* and *inertia*—principles founded in fact, reason, and nature —and rigidly maintaining them in every process of reasoning on physical phenomena. On these conditions a correct knowledge is attainable of all the circumstances of the *grand round—vitality, organization,* and *reproduction*, only excepted.

T. H. PASLEY.

Jersey, 1841.

HYDROSTATIC LAMP.



Sir,—I beg to hand you for insertion in the *Mechanics' Magazine* the following description of a self-supplying lamp on hydrostatic principles, which I devised as long ago as 1825.

I am, Sir, yours, respectfully,

N. N. L.

May, 1841.

Description of a plan for maintaining the oil of a lamp at a uniform level.

A, is the reservoir for oil, from whence there is a free communication with the burner by the branch tubes B B. C, is a fountain reservoir containing a heavy fluid, the neck or shank of which enters the tube D, which has a small trough at the bottom.

The reservoir C and tube D being filled with the heavy fluid, and the remainder of the instrument with oil, it will be seen that there is a column of oil E F supported or held in equilibrium by a column of the heavy fluid G F. The action of the lamp will then be as follows:—As the oil is consumed and sinks in the burner below the line E, the equilibrium of the two columns will be disturbed; the heavy fluid will begin to descend in the tube D, and a portion will be pressed over the edge of the trough and fall by its own gravity to the bottom of the oil reservoir, displacing an equal quantity of oil, which will thereby be raised in the burner again. At the same time that the heavy fluid descends in the tube D, the air-hole of the reservoir C becomes uncovered; a bubble of air enters and displaces a portion of the fluid, by which it is again raised to its original height in the tube D. In this way the action of the lamp will continue until all the oil in the reservoir, below the line F, is consumed, and its place occupied by the heavy fluid from the reservoir, C. The oil will be maintained at an uniform level in the burner of this lamp as perfectly as it is in the common fountain lamp, without being open to the objection against that lamp, of casting a shadow.

To set the lamp in action, a portion of heavy fluid should first be poured into the tube D, sufficient to fill the trough, which should be capacious enough to contain as much fluid as would fill the tube D. The oil is then to be poured in at the burner. There should be a stop-cock at the bottom of the reservoir A, to draw off the heavy fluid, when it is full.

N. N. L.

OBSERVATIONS ON THE EFFECT OF WIND ON THE SUSPENSION BRIDGE OVER THE MENAI STRAIT, MORE ESPECIALLY WITH REFERENCE TO THE INJURIES WHICH ITS ROADWAY SUSTAINED DURING THE STORM OF JANUARY, 1839. BY W. A. PROVIS, ESQ., M. INST. C. E.

In the month of December, 1825, when the original construction of the bridge was nearly completed, several severe gales occurred, and considerable motion was observed, both in the main chains and in the platform of the carriage ways. It appeared that the chains were not acted upon simultaneously, nor with equal intensity; it was believed, therefore, that if they were attached to each other, and retained in parallel plains, the total amount of movement would be diminished.

On the 30th of January, and on the 6th of February, 1826, some heavy gales again caused considerable motion of the chains and roadway, breaking several of the vertical suspending rods, and of the iron bearers of the platform.

These bearers were constructed of wrought iron bars, overlapping each other, and bolted together, with the ends of the suspending rods between them, for the purpose of giving stiffness to the structure. The flooring planks were bolted to the bearers, and notched to fit closely round the suspending rods, which were thereby held almost immoveably in the platform.

It was observed, that the character of the motion of the platform was not that of simple undulation, as had been anticipated, but the movement of the undulatory wave was oblique, both with respect to the lines of the bearers, and to the general direction of the bridge. It appeared that when the summit of the wave was at a given point on the windward side, it was not collateral with it on the leeward side, but, in relation to the flow of the wave, considerably behind it, and forming a diagonal line of wave across the platform.

The tendency of this undulation was, therefore, to bend the bearers into a form produced by the oblique intersection of a vertical plane with the surface of the moving wave. The bearers were not calculated to resist a strain of this nature, they therefore were fractured generally through the eyes on each side of the centre foot-path, at the point of junction with the suspending rods, which being bent backwards and forwards where they were held fast at the surface of the roadway, were in many instances wrenched asunder also.

The means adopted for repairing these injuries, and for preventing the recurrence of them, were, placing a stirrup, with a broad sole, beneath each of the fractured bearers, attaching it by an eye to the suspending rod, cutting away the planking for an inch around the rods, and at the same time bolting, transversely, to the underside of the roadway, an oak plank, fifteen feet long, between each two bearers, for the purpose of giving to the platform a greater degree of stiffness, combined with elasticity, than it previously possessed. The four lines of main chains were also connected by wrought-iron bolts passing through the joint plates, and traversing hollow cast-iron distance pieces, placed horizontally between the chains.

The effects of these alterations were so beneficial, that little or no injury occurred for nearly ten years. On the 23rd of January, 1836, a more than usually severe gale caused violent undulation of the platform, and broke several rods. There can be little doubt that ten years' constant friction, combined with the shrinking of the timber, had relaxed the stiffness of the platform, and permitted an increased degree of undulation. The gate-keeper described the extreme amount of rise and fall of the roadway in a heavy gale to be not less than sixteen feet; the greatest amount of motion being about half way between the pyramids and the centre of the bridge.

In consequence of the injuries sustained during this gale, the author and Mr. Rhodes were instructed to give in a report upon the state of the bridge, and on any repairs or additions which might appear desirable.

The result of the examination was satisfactory; the whole of the masonry, the main chains, their attachments to the rock, the rollers and iron-work upon the pyramids, and all the principal parts of the bridge, were as perfect as when first constructed; it was, however, recommended that "a greater degree of rigidity should be given to the roadways, so that they should not bend so easily under vertical pressure."

The bridge remained in the same state until the hurricane of the 6th and 7th of January, 1839; during the night of the 6th, all approach to the bridge was impracticable; the bridge-keeper, however, ascertained that the roadways were partially destroyed, and he in consequence traversed the strait in a boat in time to prevent the down mail from London driving on to the bridge.

When the day broke, it was found that the centre footpath alone remained entire, while both the carriage ways were fractured in several places. The suspending rods appeared to have suffered the greatest amount of injury; out of the total number of 444, rather more than one-third were torn asunder; one piece, 175 feet long, of the N.E. carriage way, was hanging down and flapping in the wind; much of the parapet railing was broken away; the ties and distance pieces between the main chains were destroyed; the chains

had resisted well in spite of the violent oscillation they had been subjected to, to such an extent as to beat them together and strike the heads off bolts of three inches diameter.

Means were immediately adopted for restoring the roadways: and so rapidly was this effected, that in five days carriages and horses passed over, while foot passengers were not at any time prevented from crossing.

The account of the restoration of the bridge, communicated by Mr. Maude, to the Institution, is then alluded to.

The substance of the report of the author to the Commissioners of Her Majesty's Woods is then given, and a review of the proposals made by Mr. Comms, Colonel Pasley, and others, relative to the restoration.

The opinion of Colonel Pasley, "that all the injuries which have occurred to the roadways of suspension bridges must have been caused by the violent action of the wind from below," is then examined, and reasons given for the author's dissent from that opinion.

The action of the wind upon the Conway and Hammersmith bridges is next examined, and from the amount of oscillation observed in all suspension bridges, the conclusion is arrived at, that winds act strongly and prejudicially on the fronts as well as on the horizontal surfaces of the platforms of suspension bridges, and that the effect of winds is modified and varied by the nature of the country, and the local circumstances connected with each individual bridge. Although differing in opinion with Colonel Pasley as to the general cause of injury to suspension bridges, the author agrees with him in the propriety of giving increased longitudinal rigidity to their platforms, to prevent or to restrict undulation. He advised its adoption in 1836, and applied his plan of stiffening by beams, in 1839. He preferred beams to trussed framing, on account of the facility with which the former could be increased in number, to obtain any requisite degree of stiffness, and because he feared that trussed frames could not always be kept firmly in their true vertical positions.

A drawing showing the injuries sustained by the platform during the hurricane of 1839, accompanied the communication.

Mr. Cowper was of opinion, that the real cause of injury to suspension bridges was the vibration of the chains and roadway. The whole suspended part, when acted upon by the wind, became in some measure a pendulum, and if the gusts of wind were to recur at measured intervals, according either with the vibration of the pendulum, or with any multiplies of it, such an amount of oscillation would ensue as must destroy the structure. He illustrated this proposition by a model with chains of different curves, and at the same time pointed out the efficiency of slight brace chains in checking the vibration.

Mr. Brunel agreed with Mr. Cowper in his opinion of the cause of injury to bridges, and with the propriety of applying brace chains, for preventing the vibration. He then alluded to the introduction of lateral braces in the bridge designed by Mr. Brunel, Sen. for the Isle of Bourbon. He had been at the Menai Bridge during a severe storm, and had particularly noticed the vibration of the chains, with the accompanying undulation of the platform. The force of the wind was not apparently from beneath; it appeared to act altogether laterally. The chains were too high above the roadway; their vibration commenced before the platform moved: the unequal lengths of the suspension rods then caused the undulating motion. His attention had latterly been much given to the subject on account of the Clifton Suspension Bridge now erecting under his direction. The span would be seven hundred feet, and the height above the water about 200 feet. He intended to apply the system of brace chains at a small angle to check vibration. To two fixed points in the face of one pyramid would be attached two chains, each describing a curve horizontally beneath the platform, touching respectively the opposite sides of the centre of the bridge, and thence extending to similar points on the other pyramid: there they were attached to two levers, the ends of which were connected with a counter balance of about four tons weight appended to each; these weights would hold the chains sufficiently extended to enable them to resist the lateral action of the strongest winds without their being so rigid as to endanger any part of the structure. By this contrivance the platform would be kept firm, which was the chief point to be attained.

In all suspension bridges the roadways had been made too flexible, and the slightest force was sufficient to cause vibration and undulation. The platform of the Clifton Bridge would have beneath it a complete system of trough-shaped triangular bracing, which would render it quite stiff. He was an advocate for bringing the main chains down to the platform, as at the Hammersmith Bridge, and for attaching the bearers to the chains at two points only; when they were suspended by four rods, it not unfrequently happened that the whole weight of a passing load was thrown upon the centre suspension rods, and the extremities of the bearers were lifted up and relieved from all pressure. The extent of the expansion and contraction of the chains was a point of im-

portance. In the Menai Bridge the main chains on a summer day would be as much as 16 inches longer than in a winter's night.

At the Clifton Bridge the difference under similar circumstances would be about 20 inches. The whole expansion of the back chain beyond the pyramids must be thrown into the suspended part. He would prefer having only one chain on each side of the bridge, and that chain much stronger than is usually adopted, but in deference to public opinion he had put two; he believed that they rarely expanded equally, and hence an unequal distribution of the weight of the roadways upon the suspension rods occurred. A rigid platform would in some degree prevent this, but he had endeavoured to lessen the effects of unequal expansion by arranging a stirrup at the top of each suspending rod, so as to hold equally at all times upon both the chains, and thus cause each to sustain its proportion of the load.

Mr. Seaward had never seen the force of wind exerted at regular intervals, as Mr. Cowper had supposed; if the gusts were repeated at such intervals, no suspension bridge, nor any elevated shaft or chimney in masonry, could resist them.

Mr. Rendel believed that the errors committed in the construction of suspension bridges had principally arisen from engineers theorizing too much on the properties of the catenary curve, without attending sufficiently to the practical effects of wind in the peculiar localities in which the bridges were placed. He could not agree with Mr. Cowper in his view of the intermittent action of the wind, or the vibrating of the chains. Observation had led him to conclude that, in the positions in which suspension bridges were usually placed, the action of the wind was not uniform; for instance, it would act at the same moment on the upper side of one end of the roadway, and on the lower side at the other end. In this case, unless the platform possessed a certain degree of rigidity, undulation was induced and oscillation ensued. Braces and stays would not counteract this—nothing but a construction of platform, which made it in itself rigid by some mode of trussing, could withstand this kind of action. He agreed with Mr. Brunel in his idea of reducing the number of the suspending chains. At the Montrose Bridge, which was 432 feet span, he had endeavoured to avoid all complexity of contrivances by adopting a complete system of vertical diagonal trussing, which was ten feet deep—five feet above, and five feet below the platform,—so as to insure rigidity, and to produce that solidity which was essential for preventing undulation and oscillation.

Mr. Cowper reverted to the motion which he had found to be so easily produced by repeatedly exerting a small force at measured intervals against the main chains of the Hammersmith Bridge. He conceived that if the chain oscillated, the roadway must oscillate also.

Mr. Rendel contended that the motion produced by the impulses communicated by Mr. Cowper to the chain resolved itself into undulation, and not oscillation. He could not understand the advantages of the trussing adopted at the Hammersmith Bridge: it appeared to him that its tendency was, on the passage of a heavy weight, to relieve four out of five of the suspending rods from their due proportion of the load, and to throw it upon the fifth rod. His object in the construction of the framing of such platforms had always been to spread the load quite equally, and rendering it rigid by means of vertical trussed framing, to prevent the undulation which was the primary cause of oscillation. He would distinguish clearly between the two motions, and say, that undulation was motion in the direct line of the platform, and that oscillation was a motion at right angles with it. Vibration was identical with undulatory action.

Mr. Donkin conceived that a good system of trussed framing could alone prevent undulation or oscillation; if the framing were placed vertically, its tendancy would be to prevent undulation; if placed horizontally, to prevent oscillation: now, as Mr. Rendel had given it as his opinion, that the latter action resulted from the former, the system of trussing adopted by him at the Montrose Bridge would appear calculated to obtain the desired end. A slight exertion of force would produce a perceptible undulation, and a certain degree of vibration would result from the natural elasticity of the materials.

Mr. Seaward remarked, that the degree of oscillation would appear to depend in some measure upon the distance at which the platform was suspended beneath the chains, and upon the distance between the points of suspension of the main chains: if the platform was rigidly held at the extremities, the motion would be vibratory, and not amounting to undulation.—*Trans. Inst. Civ. Eng.*

ON A METHOD OF SETTING OUT INVOLUTE TEETH OF WHEELS, SO THAT ANY TWO WHEELS OF THE SAME OR OF DIFFERENT DIAMETERS WILL WORK TRULY TOGETHER, WHETHER THE TEETH BOTTOM OR ONLY JUST TOUCH EACH OTHER. BY MR. EDWARD COWPER.

The rule is briefly this:—

Point off the teeth on the pitch circle in the usual manner; then take the smallest wheel of the set, and having decided upon the depth of the proposed tooth, describe a

circle (called the Evolute) touching the bottom of the tooth. On all the other wheels describe evolute circles, bearing the same proportion to *their* respective pitch circles, which the evolute circle of the smallest wheel bears to *its* pitch circle—thus, if in the smallest wheel the evolute circle is $\frac{1}{12}$th less than the pitch circle, let all the other evolutes be $\frac{1}{12}$th less than *their* pitch circles. From these evolute circles as bases, describe the involute curves of the teeth, making the curves pass through the points set out for the teeth, upon the pitch line.—*Trans. Inst. Civ. Eng.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

THOMAS LAWES, OF CANAL-BRIDGE, OLD KENT-ROAD, FEATHER FACTOR, *for certain improvements in the method, process, and apparatus for cleansing and dressing feathers.* Petty Bag Office, May 10, 1841.

The feathers are placed in a long cylindrical vessel, through which a horizontal shaft passes, equipped with projecting arms or beaters; the sides and ends of the containing vessel are covered with wire grating, and a trough of the same material extends along the bottom of the vessel. The vessel being filled with water, the shaft is made to revolve by any suitable means, and the feathers are agitated in the water till thoroughly cleansed; they are then passed into a vessel of hot water, after which they are pressed to get rid of as much of the water as possible, and are then placed in a long revolving heated cylinder, furnished with projecting arms in its interior, which, coming in contact with the masses of feathers, divides and distributes them.

The claim is 1. To the application of machinery to washing and cleansing feathers, by whatever mechanical arrangements the operation may be performed.

2. To the arrangement of apparatus for the purpose of drying and dressing feathers, and also the employment of two or more cylinders placed one within the other, for the purpose herein mentioned, whether the said apparatus be employed in concert with the washing apparatus, or without it.

WILLIAM M'KINLEY, OF MANCHESTER, ENGRAVER, *for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics.* Petty Bag Office, May 10, 1841.

The planed upper edges of the side framing of this machine form a railway, upon which a carriage runs backward and forward upon flanged rollers; this carriage is provided with two bevelled boards (1 and 2) hinged to an upright at each end of it, their tapered edges being opposite each other. Two other bevelled boards (3 and 4) are hinged to the cross framing at each end of the machine, armed with a fish skin or rough surface, for holding the folded cloth. To the side frames of the machine standards are screwed, which support the guide rails that conduct the cloth to be folded, into the machine.

The operation is as follows:—The first fold of cloth being laid upon the bed of the machine by the leaf 1, upon the first traverse of the carriage it is held by the leaves 3 and 4; then as the carriage returns, the leaf 2 falls, and passing over the cloth, lays another fold upon the bed, and as the carriage approaches the end of its traverse, a catch-pin fixed beneath it strikes upon a tappet, the tail-piece of which, acting on a lever under the leaf 3, causes that leaf to be lifted upwards, in order to allow the cloth to be passed under it; upon the tappet being released the leaf 3 falls and retains the folded cloth. The carriage now retrogrades, and the leaf 1 falling and passing over the cloth lays down another fold, which is passed under leaf 4 in the manner before described in respect to the leaf 3. As the cloth accumulates upon the bed, it is caused to descend a little by means of mechanism acting simultaneously with the folding process.

CHARLES EDWARD AMOS, OF GREAT GUILDFORD-STREET, SOUTHWARK, MILLWRIGHT AND ENGINEER, *for certain improvements in the manufacture of paper.* Petty Bag Office, May 10, 1841.

The nature of these improvements is sufficiently well defined by the following claims:—

1. To the invention of gradually lowering the roll in the vessel known to paper-makers by the name of engine, by means of self-acting machinery worked by the same rotary power as the engine itself; and which self-acting machinery can be regulated as to the velocity with which it acts upon the engine roll.

2. To the combination of machinery described, or any modification of the same which will regulate the quantities of pulp and back-water, according to the speed at which the paper-making machine may be working, being what is termed self-acting.

3. To the manner of working the pulp through the sieves by the action of the clapper, the sieves remaining quiescent: also, the method of working the pulp through the sieves by pneumatical action.

4. To the general arrangement by which

the particular kind of curvilinear or undulating motion of the table is obtained, from the combined action of the vibrating levers.

5. To the use of small tubes perforated with holes, or with slots cut longitudinally, the tubes forming the table over which the wire passes; also the means by which the flow of water through the tubes can be stopped at pleasure.

6. To any modification of levers, arms, rods, or chains, for bearing or supporting the frame of the table part of the paper-making machine on which the pulp is formed into paper, when more than two bearings or points of support are used, and also when the side frames carry all the rolls, tubes, &c., which belong to the wire table.

7. To the mode of heating the drying and other cylinders, by turning the air or vapour arising from combustion through the cylinders; also, the equalization of those vapours by the admission of common air, when used for the purpose herein described.

8. To the flat sliding and quiescent presses; also, the right to such presses, whether the moveable press works on guides, or in the arc of a circle, by a single lever or a combination of levers.

Otto C. Von Almonde, of Threadneedle-street, Merchant, *for improvements in the production of mosaic work from wood.* Enrolment Office, May 12, 1841.

A number of long square strips of the fancy coloured woods of which the mosaic work is to be composed, are glued together and pressed into a solid block, from the ends of which, when dry, thin plates are sawn off and employed in the usual manner, for any required purpose.

There is really very little that is either new or useful in this long specification, which occupies three skins of parchment: and in fact a doubt on this head is expressed therein.

The principal novelty is the strong glue that is prescribed for the purpose, which is made in the following manner:—Equal quantities of parchment, size, and common glue are boiled together with half an ounce of white sugar candy, and half an ounce of gum tragacanth previously soaked in water for 24 hours, and half an ounce of isinglass dissolved in water; these ingredients being boiled together, the glue is ready for use. Or it may be still further improved by adding to every pound of glue, half a pint of copal dissolved in spirits, poured in a boiling state into the hot glue.

John Dockree, of Galway-street, St. Luke's, Gas Fitter, *for an improvement or improvements in gas burners.* Petty Bag Office, May 15, 1841.

The first improvement relates to jet burners, and consists in drilling two holes in the centre of the top iron plate obliquely, and then drilling two other holes, one on each side the former at right angles thereto; so that the gas issuing out of the side holes strikes on the flame from the centre ones, and elongates it so as to admit of straight glass chimnies being employed.

The second improvement is in the use of a cone under the glass holder, having one or two rows of holes perforated through it to admit the atmospheric air in such a manner as to make the combustion more perfect.

The third improvement refers to Argand burners, and consists in fastening on the top of the burner a plate of metal, and then, after drilling holes for the gas to come out at, to drill six or more holes in a circular form, and one in the centre, for atmospheric air. And further, in making circular caps or plates perforated in this manner, and fitting them on to the burners at present in use.

James Deacon, of St. John Street Road, Gentleman, *for improvements in the manufacture of glass chimneys for lamps.* Enrolment Office, May 19, 1841.

These improvements consist simply in forming a flat glass plate or deflector within the chimney, equivalent in its action to the metallic deflector patented by Mr. Smith and described in our 910th number. "I am aware," says the present patentee, that it is not new to cause the air which supports the combustion of the flame to be deflected in a direction towards the centre or middle of the chimney, at a point above the wick or point of combustion of the lamp; metallic surfaces have been used for such purposes before, and patents have been taken out for the means of applying such metallic surfaces. And I am also aware that glass chimneys have been made with contracted openings from the lower portion thereof into the upper portion thereof* but I believe they have not been successful in use. What I claim as my invention is the new combination of means and the new construction of chimneys for lamps herein-before described, by projecting rings or partitions of glass having each an opening for the flame to pass through."

John Ashton, of Manchester, and John Wakefield, of Salford, Hat Manufacturers *for certain improvements in the manufacture of hat bodies.* Enrolment Office, May 21, 1841.

These improvements consist in the employment of slender strips of Palmetto Palm leaves, or as it is sometimes called Brazillian grass, woven into a fabric either with or without other materials, in lieu of the platted willow heretofore used for that purpose, The hat body so formed is coated with "waterproof"—*i.e.* shellac dissolved in spirits of wine, and then covered with shag or plush in the usual manner; by which

* The form here disclaimed and condemned is figured in our 899th and 900th numbers, vol. xxxiii, pages 433 and 451.

means a lighter and stronger fabric is said to be obtained. All the stages of the processes are very minutely detailed in the specification, but the substance of the whole is very clearly enumerated in the claim which is,—

1. To the improvements described in the manufacture of hat bodies, of making the same out of pieces of a loom woven tissue of strips of Palmetto palm leaves.

2. To the improvements described of making hat bodies out of pieces of a compound loom woven tissue of strips of Palmetto palm leaves, woven in combination with yarns or threads of cotton or flax.

3. To the improvement described of making hat bodies with the round sides or cylindrical parts thereof in one piece of continuous loom woven compound tissue, or nearly continuous loom woven tissue, of strips of Palmetto palm leaves woven in combination with yarns or threads of cotton or flax as herein-before described.

WILLIAM HENRY HUTCHINS, OF WHITECHAPEL-ROAD, GENTLEMAN, AND JOSEPH BAKEWELL, OF BRIXTON, CIVIL ENGINEER, *for improvements in preventing ships and other vessels from foundering, and also for raising vessels when sunk.* Enrolment Office, May 21, 1841.

The improvements included in this patent consist in the employment of air-tight bags, composed of Mackintosh cloth or other suitable substance, furnished with an inlet and outlet pipe or safety-valve, which bags when filled with air are to be placed around the interior of ships between the ribs, and under each of the decks between the beams, so as to give to the vessel such a degree of buoyancy as should keep it afloat even if filled with water, and thereby prevent foundering. For the purpose of raising sunken vessels the bags are first attached in an empty state to the wreck, and subsequently inflated by air-condensing pumps until sufficient buoyancy is communicated to cause the wreck to float.

The claim is, to the permanent application of inflated waterproof bags combined with inlet valves and safety valves, in the manner described, in such various recesses and parts of ships or other navigable vessels, as will interfere as little as possible with the stowage of cargo, consistent with affording a sufficient degree of buoyancy to keep the vessel afloat in case of its being filled with water. Also, the application to a sunken vessel of similar bags in a collapsed state, each bag combined with an inlet and an outlet or safety valve, and with a hose communicating with an air-inflating apparatus; such bags being made fast to the various parts of a vessel, or to eyes screwed into the hull for the purpose of forming attachments to which the bags may be lashed.

FRANCIS POPE, OF WOLVERHAMPTON, ENGINEER, *for improvements in detaching locomotive and other carriages.* Enrolment Office, May 24, 1841.

This invention consists of an ingenious piece of mechanism by which a horse can be instantly detached from the vehicle to which he is attached—or one carriage can be separated from another on railways. When applied to horse carriages, each shaft terminates in two iron side plates carrying a pin which form the axis of the shafts, and is the means by which they are attached to the carriage. There are also two side plates attached to the carriage, carrying a pin which forms the axis of motion to a bent lever or tongue; this tongue when turned back embraces the pin on the end of the shafts and holds it securely in the recess formed for it. The tongue is held down by a peculiarly formed spring catch, to which a lever is affixed. So long as the tongue is held down by this catch, the shafts are securely held to the carriage, but on pulling the lever the catch is disengaged, the tongue flies over and the shafts and horse are released When applied to railway carriages three of these attachments are employed, the centre one being a bar corresponding to the end of the shafts in the former case, and the two outer ones being chains. The three catches are simultaneously acted upon by an apparatus terminating in a handle which runs up to the seat of the guard. The claim is to the mode of constructing and applying apparatus as described.

HUGH GRAHAM, OF BRIDPORT-PLACE, HOXTON, ARTISAN, *for an improved manufacture of that kind of carpeting usually denominated Kidderminster carpeting.* Enrolment Office, May 8, 1841.

The yarn or weft is dried and scoured in the usual manner; when dry it is wound on bobbins and reeled on an ordinary traversing reel. The skein is then arranged on dyeing poles, and the one-half immersed in any required color; when this portion is dyed, the other half is dyed of some other color, so that the yarn, or weft, is of two different colors in its width. It is then mounted in a loom in the ordinary way, and woven, when, in consequence of the former process, the face of the carpet will exhibit the figured or ground color changed alternately at pleasure, giving the appearance of a drop pattern, as is sometimes done in Brussels carpets.

The claim is to "the improved manufacture described of that kind of carpet usually denominated Kidderminster Carpeting, with weft threads dyed as aforesaid, whereby I am enabled to prevent the stripy appearance so objectionable in Kidderminster carpets manufactured the ordinary way, and to produce a much greater variety of pattern in such carpets, and of much greater beauty and elegance than heretofore."

LIST OF DESIGNS REGISTERED BETWEEN APRIL 23RD AND MAY 25TH.

Date of Registration. 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
April 23	677	Thomas Hopkins	Carpet	1 years.
26	678	I. and F. Harwood	Inkstand	3
27	679	I. J. Hollingshead	Pen	3
"	680	Dovey and J. Hawkesford	Screw	3
"	681	H. I. and J. Dixon	Carpet	1
28	682	I. Hynam	Label	1
29	683	Summers and Smith	Embossed paper	1
30	684	I. and T. Walker	Cantoon	1
"	685	D. Morison	Press	3
"	686	W. Cribb	Label	1
May 4	687	F. Ogden	Instep stretcher	3
"	688,9	I. and J. Walker	Cantoon	1
6	690	The Carron Company	Stove	3
"	691	W. Sampson	Mat	1
10	692	I. Ridgway and Co.	Plate	1
"	693	Wright and Crump	Carpet	1
"	694	S. A. Carpenter	Chain and link for braces	3
11	695	Lea and Co.	Carpet	1
12	696	H. I. and I. Dixon	Ditto	1
17	697	Sommervill Buckhous	Pen	3
20	698	E. Heeley and Co.	File	3
21	699	T. F. Berney	Gun stock	3
24	700	— Molyneux	Label	1
"	701	W. W. Nicholson	Bath	3
25	702,3	James Dobson and Sons	Carpet	1

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH OF APRIL AND THE 26TH OF MAY, 1841.

André Drouot de Charlieu, of Coleman-street-buildings, gentleman, for improvements in preparing matters to be consumed in obtaining light, and in the construction of burners for burning the same. (A communication.) April 27; six months to specify.

James Sims, of Redruth, Cornwall, civil engineer, for certain improvements in steam-engines. April 29; six months.

Alfred Jeffery, of Prospect-place, New Hampton, gentleman, for a new method of defending the sheathing of ships and of protecting their sides and bottoms. April 29; six months.

George Townshend, of Sapcott-fields, Leicester, esquire, for improvements in machinery or apparatus for cutting certain vegetable substances. April 29; six months.

Joseph Gibbs, of Kennington, civil engineer, for a new combination of materials for making bricks, tiles, pottery, and other useful articles, and a machine or machinery for making the same, and also a new mode or process of burning the same, which machine or machinery and mode or process of burning are also applicable to the making and burning of other descriptions of bricks, tiles, and pottery. April 29; six months.

Miles Berry, of Chancery lane, for certain improvements in machinery or apparatus for making or manufacturing nails and brads. (A communication.) May 4; six months.

Francis Joseph Massey, of Chadwell-street, Middleton-square, watch manufacturer, for improvements in the method of winding up watches and other time keepers. May 4; six months.

Edward Newton, of Leicester, manufacturer, and James Archbold, of the same place, machinist, for improvements in producing ornamental or tambour work in the manufacture of gloves. May 4; six months.

Charles Thomas Holcombe, of Bankside, Southwark, iron merchant, for certain lubricating or preserving matters for wheels and axles, applicable also to the bearings, journals, or other parts of machinery. May 6; four months.

Hugh Graham, of Bridport-place, Hoxton, artisan, for an improved manufacture of that kind of carpeting usually denominated Kidderminster carpeting. May 6; two months.

Moses Poole, of Lincoln's Inn, esquire, for improvements in the manufacture of fabrics by felting. (A communication.) May 6; six months.

Philemon Augustine Morley, of Birmingham, manufacturer, for certain improvements in the manufacture of sugar moulds, dish covers, and other articles of similar manufacture. May 6; six months.

James Hancock, of Sidney-square, Mile End, civil engineer, for certain improvements in the manufacture of locks, keys, latches, and other fastenings, part of which improvements are applicable to taps and cocks for drawing off fluids. May 6; six months.

John Paley, jun., of Preston, manufacturer, for certain improvements in looms for weaving. May 10; six months.

Hooton Deverill, of Nottingham, lace manufacturer, for certain improvements in machinery for making and ornamenting lace, commonly called bobbin net lace. May 10; six months.

Andrew Mc Nab, of Paisley, North Britain, engineer, for certain improvements in the manufacture of bricks. May 11; four months.

Edmund Taylor, of King William-street, gentleman, for certain improvements in the construction of carriages used on railroads. (A communication.) May 11; six months.

Henry Pinkus, of Maddox-street, Saint George, Hanover-square, for an improved method or methods of applying electrical currents or electricity, either frictional, atmospheric, voltaic, or electro-magnetic. May 14; six months.

James Gregory, coal master, and William Green, tinner, both of West Bromwich, for certain improvements in the manufacture of iron and steel. May 14; six months.

Pierre Journet, of Dean-street, Soho, engineer, for improvements in fire-escapes, which improvements are applicable to other useful purposes. May 19; six months.

John Carr, jun., of Paddington, engineer, for im-

provements in apparatus for retarding and stopping railway carriages. May 20; six months.

Charles Phillips, of Chipping Norton, engineer, for improvements in reaping and cutting vegetable substances as food for cattle. May 20; six months.

Joseph Woods, of Laund-place, Lambeth, civil engineer, for certain improvements in locomotive engines, and also certain improvements in machinery for the production of rotatory motion for obtaining mechanical power, which improvements in machinery are also applicable for raising or impelling fluids. May 22; six months.

William Gall, of Beresford-terrace, Surrey, for certain improvements in the construction of inkstands. (A communication.) May 22; six months.

John Ainslie, farmer, Redhingh, North Britain, for a new and improved mode of making or moulding tiles, bricks, retorts, and such like work from clay and other plastic substances. May 22; four months.

Christopher Dumont, of Mark-lane, for improvements in the manufacture of metallic letters, figures, and other devices. (A communication.) May 22; six months.

John Winterborn, of Clarence-place, Hackney-road, surgeon, for improvements in machinery to facilitate the removal of persons and property from premises in case of fire, which improvements are applicable to raising and lowering weights generally, to assist servants cleaning windows, and as a substitute for scaffolding. May 22; six months.

William Lewis Rham, of Winkfield, Berks, clerk, for certain improvements in machinery or apparatus for preparing land and sowing or depositing grain, seeds, and manure. May 25; six months.

John Whitehouse, of Deptford, engineer, for an improved method of making boilers to be used in marine steam-engines. May 25; six months.

William Joest, of Ludgate-hill, merchant, for improvements in propelling vessels. (A communication.) May 26; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22ND APRIL AND THE 22ND MAY, 1841, LAST DATE INCLUSIVE.

Ezra Jenks Coates, of Bread-street, Cheapside, London, merchant, for improvements in the forging of bolts, spikes and nails. Sealed, April 28, 1841. (A communication from abroad.)

John Watson, of Glasgow, Scotland, merchant, for improvements in printing fabrics where discharging presses are used. April 28.

John Haughton, of Liverpool, Clerk, M.A., for improvements in the means employed for preventing railway accidents, resulting from one train overtaking another. April 28.

James Ransome and Charles May, of Ipswich, Suffolk, machine makers, for improvements in the manufacture of railway chairs, railway and other pins or bolts, and in wood fastenings and trenails. April 28.

[illegible]er Fairbairn, of Leeds, York, engineer, and [illegible]am Suttill, of Newcastle-upon-Tyne, flax spinner, for certain improvements in drawing flax, hemp, wool, silk and other fibrous substances. April 28.

William Newton, 66, Chancery Lane, Middlesex, civil engineer, for improvements in spinning and twisting cotton, and other materials capable of being spun and twisted. April 30. (Being a communication from abroad.)

Thomas Robinson, of Wilmington Square, Middlesex, gentleman, for improvements in drying wool, cotton, and other fibrous materials, in the manufactured and unmanufactured state. April 30. (Being a communication from abroad.)

Lancelot Powel, of Clydach Works, Brecon, iron master, and Robert Ellis, of Clydach, aforesaid, agent, for improvements in the manufacture of iron. May 5.

William Edward Newton, 66, Chancery Lane, Middlesex, civil engineer, for certain improvements in the process, or method of manufacturing lime cement, mastic artificial stone, stucco, and other similar compositions possessing the useful properties of hardness, colour, and indestructibility when exposed to damp. May 7. (Being a communication from abroad.)

David Walther, of Angel Court, Throgmorton-street, London, merchant, for certain improvements in the methods of purifying vegetable and animal oils, fats, and tallows, in order to render those substances more suitable for soap making, or for burning in lamps, or for other useful purposes, part of which improvements are also applicable to the purifying of the mineral oil or spirit, commonly called "Petrollum or Naptha, or Coal Tar, or Spirit of Coal Tar." May 7. (Being a communication from abroad.)

James Whitelaw and George Whitelaw, engineers, residing in Glasgow, Scotland, for a new mode of propelling vessels through the water, with certain improvements in the steam engine when used in connection therewith, parts of which improvements are applicable to other useful purposes. May 10.

Thomas Lawes, of Canal Bridge, Old Kent Road, Surrey, feather factor, for certain improvements in the method or process, and apparatus for cleansing and dressing feathers. May 10. (Being a communication from abroad.)

Angier March Perkins, of Great Coram-street, Middlesex, engineer, for improvements in apparatus for heating, by the circulation of hot water, and for the construction of pipes or tubes, for such and other purposes. May 12.

George Dacres Paterson, of Truro, Cornwall, Esq., for the following improvements in curvilinear turning that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning. May 12.

William Kenworthy, of Blackburn, Lancaster, spinner, and James Bullough, of the same place, overlooker, for certain improvements in machinery or apparatus for weaving. May 17.

Christopher Dumont, of Mentz, Germany, but now of Mark Lane, London, for improvements in manufacture of metallic letters, figures, and other devices. May 17. (Being a communication from abroad.)

John Paley, junior, Preston, Lancaster, manufacturer, for certain improvements in looms for weaving. May 20.

LIST OF IRISH PATENTS FOR APRIL, 1841.

F. Sliddon, Jun., certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances.

C. Cameron, certain improvements in engines to be actuated by steam or other elastic fluids.

Errata.—In Iver M'Iver's article, No. 925, page 318, col. 1, line 29, for $\sqrt{2g}\frac{d\times s}{d}$ read $\sqrt{\frac{2g\,d\times s}{16}}$.
Col. 2, line 18, for A$b=r$ read AC$=r$.

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Mechanics' Magazine,

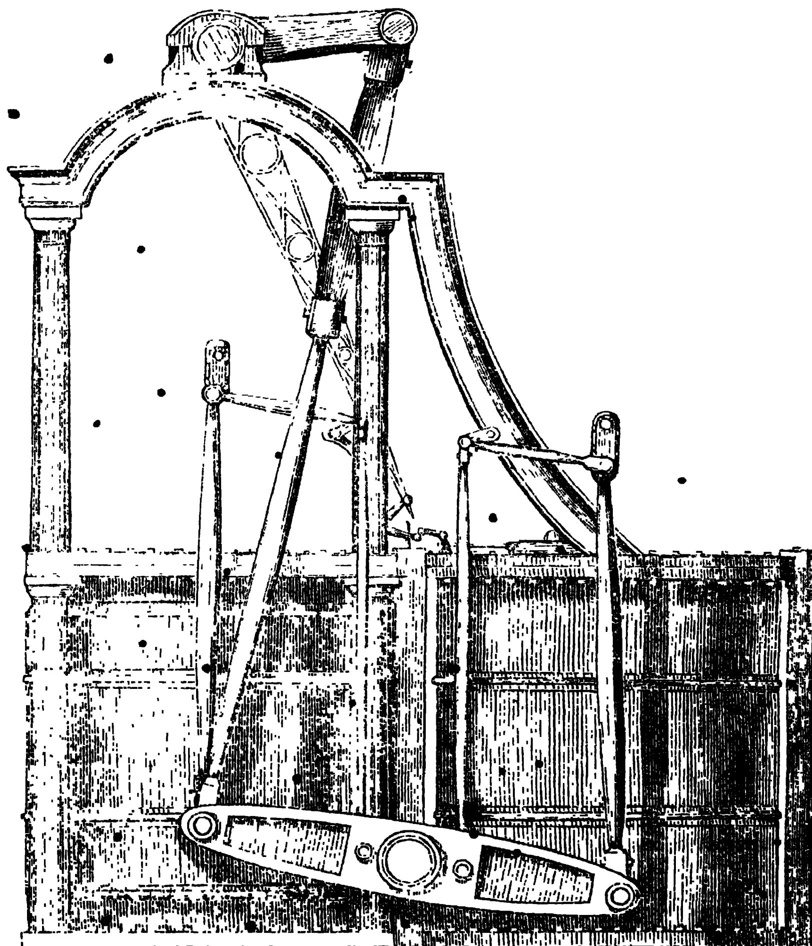
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 930.] SATURDAY, JUNE 5, 1841. [Price 3*d*.

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PILBROW'S CONDENSING CYLINDER STEAM-ENGINE.

Fig. 1.



PILBROW'S CONDENSING CYLINDER STEAM-ENGINE.

The following interesting description of Mr. Pilbrow's recently patented improvements in the steam engine is extracted from a pamphlet recently published by Boyman Boyman, Esq.,* to which we would call the attention of all persons interested in the performances of this important power and wealth creating agent.

Description of Pilbrow's Condensing Cylinder Engine.

The air-pump and condenser of the present engine are dispensed with, and a cylinder of the same size as the steam cylinder, fitted with a solid piston, combining both in one, is substituted. In this cylinder the steam is condensed by injection, whilst it is flowing into it, as it is now condensed in the present engines in the condenser; but during its condensation the uncondensed steam keeps giving to the condenser piston, until completely annihilated, just as much power as it offers resistance to the effective action of the steam piston. This resistance cannot, with the present engine, be given in favour of it, because the steam is being condensed in a vessel without a piston. The primary object with Mr. Pilbrow was not to get the steam to act expansively on the piston of his condensing cylinder, but by condensing the steam every *previous* stroke, to get, through the medium of his condenser-piston, a nearly perfect vacuum underneath it, the same as if the steam-piston *began* its stroke with a perfectly exhausted cylinder.

The vacuum, or chief power, by which condensing engines of the present construction are worked, is made only during the stroke; the power, therefore, is not got, but is being obtained whilst the steam is being condensed. By a condensing cylinder, with a solid piston, the vacuum, or chief power, is already got before the piston moves; which, in this respect, gives it the advantage possessed by the Cornish single-lifting engines, though even to a greater degree, because the condenser-piston acts as a double-action air-pump, and expels every evacuation of the cylinder at each up and down stroke. In the present engine, the air-pump, being single, permits the accumulations of two condensements in the condenser to resist the action of the piston. Though, therefore, the condenser piston will always have on its other side the condensement of the previous stroke, at 96 or 100°, and that small portion of air and gas disengaged from one condensement, it cannot have the same accumulation of air and gas which exists in the present condenser, and which gives a greater resistance than what is due to the temperature alone. The gain from this source may be considered as 1 lb. on the square inch, calculated upon the difference of the mean fluctuation in the condenser; consequently the steam can be expanded in the Condensing Cylinder engines, just as much lower as the ultimate resistance shall be found less than in the present engines. The pressure of steam from water at different temperatures, is well defined by the Tables of Mr. Watt, Dalton, and others, so that whatever may be the reduction of temperature, whilst the steam is being condensed, the pressure due to it will be given to the condenser piston, in favour of the engine, by its seeking to enter the nearly perfect vacuum already obtained on the other side.

The increase of friction will amount to the difference between the diameter of the piston of the present air-pump, and a piston as large as the steam piston. This must be deducted from the power gained by the substitution of the condensing cylinder for the condenser and air-pump. The difference, according to Tredgold, would amount to about ,050 of the original steam pressure, so that the additional power obtained by the mere superior extreme vacuum, and the greater expansion of steam, will much more than supply the power to overcome and work such additional friction. All other parts of the steam engine being the same, the saving effected by the steam piston beginning its stroke, with what is equivalent to a perfectly exhausted cylinder, will be a clear gain. This, it has been shown amounts to 4 lbs. on the square inch, on the average order of engines, under circumstances best adapted to give most duty; and for this we have the

* Pilbrow's Condensing Cylinder Steam Engine, John Weale, London, pp. 103, with two plates.

Fig. A.

Fig. B.

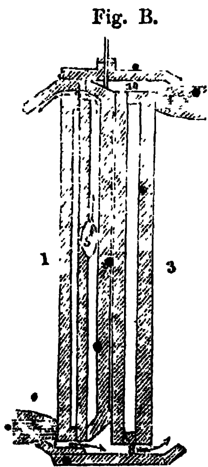
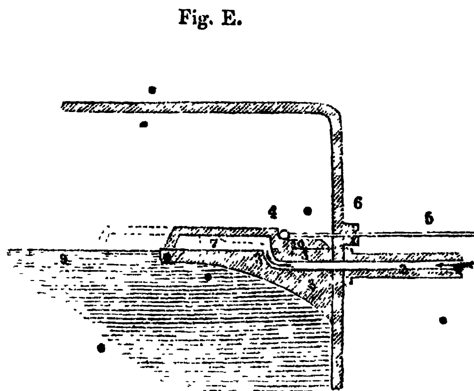


Fig. E.



highest authority in Mr. Watt. Giving the advantage to rotative engines of being worked expansively, to the greatest extent steam will permit, the comparison will then stand thus:—

Engines of the present construction so worked.

Full steam pressure in cylinder, per square inch	3	lbs.
Extreme condenser vacuum	13·5	„
	16·5	lbs.

The steam being cut off at half stroke, would reduce it to 8·25 lbs. (below atmospheric pressure) before it entered the condenser, which is as low, or nearly as low, as it can be expanded in the present constructed engines: this will give a mean pressure, during the stroke, of about 13·75 lbs. per square inch; from which deducting, as usual, one-third for friction and loss, leaves 9·17 lbs.; from this must be also deducted the mean difference which exists during the whole stroke, on the average working order of engines, between the cylinder and condenser vacuum, say, 3·5 lbs., leaving 5·67 lbs. per square inch, effective power from a giving quantity of steam or fuel.

Pilbrow's Condensing Cylinder Engine.

Full steam pressure, as before, in cylinder	3	lbs.
But as this condenser is swept out by every reversal of the piston, a better extreme vacuum than above will be maintained of about 1 lb.	14·5	„
	17·5	lbs.

This will give a mean pressure of 14·58 lbs., from which deduct, for friction and loss, (one-third as before) 4·86, leaves 9·72. From this deduct the difference in friction, between the usual air-pump piston, and the condensing cylinder piston, namely, ·72, and there remain 9 lbs. effective pressure, no deduction being necessary as in the former instance, for a difference between the mean cylinder exhaustion and condenser vacuum. Thus, by the simple addition of a condensing cylinder, where more power is required, it will be increased in the ratio of 9 to 5·67, or nearly two-thirds.

But this does not show the great advantages of this engine. Its great gain is in duty. For instance:—Where no greater power is required, the steam must, to give no greater power, be cut off earlier, say at one-sixth, instead of, as before, at one-half of the stroke; it will then enter the condenser at about 3 lbs. (below atmospheric pressure). Why the steam is enabled to be reduced so low as 3 lbs. (below the atmosphere,) before it enters the condenser, is owing to the piston having had the same mean effective pressure throughout the stroke, as where the steam entered at 8.25 lbs. From this latter had to be deducted the mean loss of 3½ lbs. resistance to the piston, from an imperfect cylinder exhaustion. But this the condensing cylinder saves, and by getting a better extreme vacuum of 1 lb. makes a gain of 4½ lbs. per square inch; 4½ lbs. and 3 lbs.=7.5. The same power is obtained to overcome the load, with steam reduced to 3 lbs., as was before with 8.25 lbs. The steam, so cut off at one-sixth, will give a mean pressure (on 17.5 lbs.) of 8.62 lbs. per square inch; from which, deducting as before (one-third,) 2.87 for friction and loss, leaves 5.76 lbs. From this deduct, for extra friction of larger piston, only .43 in this case,* which leaves a net effective pressure per square inch, throughout the stroke, of 5.33 lbs. This is within a fraction of the same power as before, (5.67 lbs. per square inch,) with a *saving of two-thirds of the steam, consequently of fuel*; because, as the value of this engine is in saving the loss from an imperfectly exhausted cylinder, by having the full effect of the vacuum upon the piston, from the *beginning* to the *end* of the stroke, there is no deduction for mean exhaustion to make, as in the former engine. This is increasing the duty of the *best* engines, under the *best* circumstances, very nearly three times, so that a passage to America, which now requires 600 tons of coal, will by this engine require but little more than 200 tons. As this is the simplest and most accurate way of comparing the relative duties of the two engines, it is needless to calculate the power of any engine of given dimensions, because the results would bear precisely the same proportions.

Conceding, however, that by varied and well-conducted experiments, it shall be clearly proved that Mr. Watt was in error, *but not till then*, and that it is better to have a mean exhaustion of 12 lbs., (*if it cannot always be got*) in an in-

* All these deductions, varied according to the data, are made upon the proportions of Tredgold's formula; which, although not perfectly accurate in every detail, are sufficiently so for all practical purposes.

jection rotative engine,) it is certain that this mean cannot be obtained by what was only sufficient to secure a mean of 10 lbs., namely, a vacuum of 27°; there must be something extra. The mean exhaustion always depends upon the condenser vacuum; and, as 27° gives only 10 lbs. *on the average* working order of engines, it would require 29° condenser vacuum to give a mean of 12 lbs. on the average. I speak always of the long or common barometer, not Bedwell's; and as there is much difference in the two, this distinction must be borne in mind. Now as the atmosphere is, on the average, 29½ in this country, I do not think it possible to get a vacuum of 29° by any steam-engine apparatus, for far more resistance than would indicate half an inch of mercury, or a quarter of a pound, is due to the accumulation of gases and liberated air, independent of the temperature. But the *reductio ad absurdum* is sometimes useful, for I have heard engineers insist on 29°. I do not believe, again, that with well-conducted indicator experiments, any rotative injection engine ever kept working at full power, with an average mean of 12 lbs. But, granted that it can be made to perform in this way, it is obtained only by a condenser vacuum of 29°, or whatever is the extreme possible vacuum. A vast deal more injection water it necessary to lower the temperature sufficiently for so much better vacuum, because the better the vacuum the lower the heat at which an appreciable resistance is given out. Well, then, we will say that 2 lbs. more per square inch on the piston are occasionally obtained; there is considerably more water to lift out of a vacuum than when the vacuum was only 27°; the atmosphere is thrown earlier upon the air-pump bucket, and the condensement is reduced considerably below 110°. These differences, by which *alone* the greater mean *can be* obtained, must then be deducted from the increase of 2 lbs.; and if we allow only 1 lb., (the lowest computation for these several losses,) there is still a mean resistance, or what is equivalent thereto, of 2½ lbs. on the square inch throughout the stroke. And in this calculation (12—9) = 3 lbs. more is given for the mere argument in favour of the present engines than Mr. Watt allowed for the average exhaustion, on account of their not being always in the best order.

No engineer has ever ventured to say that the average is less than 2½ lbs. *under any circumstances.* When, therefore, it shall be proved, by accurate experiments in reference to duty, that there is only this resistance to the piston, and that it is not thus diminished by losses elsewhere, (for those who so contend have, as yet, no data whatever to go upon,) then only 2½ lbs. must be deducted for the loss of mean cylinder exhaustion, which, taken from 9.17 lbs. as before, leaves 6.67 instead of 5.67 lbs. per square inch effective pressure for the present engines. To get the same power with the new, the steam must be cut off at one-fourth of the stroke, instead of at one-sixth, as before. This leaves a mean (on 17.5 lbs.) of 10.79 lbs., from which deduct (one-third) for the usual friction and loss, 3.59, leaves 7.2 lbs., and from this deduct ,53 for difference in friction of larger piston, leaves nett 6.67 lbs. effective pressure.* Even on this, the lowest computation of the loss of rotative engines, by the resistance of the unexhausted steam, we get the same power as before, with only one-half of the fuel. Thus, taking everything *for* the old plan and *against* the new, the duty is just doubled.

I have often noticed engineers incessantly nagging the injection regulator to get a great vacuum. I would say to them, "bear this in mind: Mr. Watt limited the best vacuum to 27°; every gallon of water you allow to enter beyond what is necessary to obtain that, your engine must lift out again, and your stoker must throw on extra shovel-fulls of coals, to convert the condensement again into steam, from a much lower temperature. If, then, your barometer is the common one, keep to 27°; if Bedwell's barometer, keep to 28½°, which is the same thing.

Where steam is not now expanded to its utmost limit, as here given credit for, the saving effected by larger cylinders

* The best cylinder exhaustion I have seen was a mean of 13.3 lbs.; but this was with a non-injecting engine, which enabled the condensement to be reduced to 50°, which is impossible in an injection engine. (See p. 33.) When this was obtained the vacuum was 30¼ by Bedwell, or 29¾ of the common barometer. This shows the inseparable connexion between the condenser vacuum and cylinder exhaustion, and what an extremely perfect vacuum there must be to get so great a mean cylinder exhaustion, the difference here being (29.5—24.6) = about 5 inches of mercury, or 2¼ lbs.

on this plan would be still more considerable. But as an increase of duty can be obtained with engines of the present construction, only that saving is here shown, which is obtained after steam is worked by the present engines, *as economically as it is possible for them to be worked under the best circumstances.* Where, however, steam is not now expanded to its full extent, those engines consume a larger quantity of coals than they ought to do; far more, in the long run, than the first cost and interest for larger cylinders, independent of the space wasted by carrying a greater quantity of fuel, and the greater resistance to the vessel from deeper immersion. As the power of engines is as the squares of their diameters, a few more inches in diameter would give the required power; the extra weight of which, will bear no comparison to the weight of fuel saved, independent of its cost. The deeper the immersion too, the denser the water becomes, and the greater the resistance.

In those cases, such as the *British Queen*, and *President*, where the power is clearly not equal to the tonnage, the simple addition of another cylinder to each engine, and the removal of the present air-pumps and condensers, will increase the power nearly two-thirds, with the same consumption of fuel, and add no more weight to the engine.

Comparison of saving in Weight and Tonnage by Pilbrow's Engine, when the Engine and Boilers are proportioned from the first.

	Tons.	Cwt.
Engines the same weight as the present. Boilers and water for 400 horse-power engines, weigh	120	0
Coals for an America passage, 16 days' consumption,* at 8lbs. per horse-power per hour	518	0
	668	0
One-third of the steam doing the same duty	222	13
Clear gain in available tonnage: two-thirds of the cost of boilers and fuel being also saved	445	7

Thus, a vessel which now has only 300 tons available, is converted, by this simple alteration, into a vessel of (say 700 tons) available for commerce.

The following is an explanation of the action of the Condensing Cylinder Engine. Though it must not be confounded with Woolf's or Hornblower's as an expansive engine, it may be found best in practice, not to let the injection condense the steam in the condensing cylinder, until the piston has made part of its stroke, there being an effectual vacuum throughout the stroke on the other side.

Description of the Engravings.

Figure A 1, (see page 419) is the steam cylinder; 2, is the piston; and 3, the rod, as usual; 4, is alternately the steam and eduction passage for the lower part of the steam cylinder; and 5, is the same for the upper part; 6 and 7, the passage alternately communicating from the steam to the condensing cylinder; 8 and 9, the slide valves adapted to this engine, though the D valves, now used, are equally applicable with the centre passage stopped up; 10, represents the entrances of the steam from the boiler to the valves; 11, is the rods moving the valves, 8 and 9, working through their stuffing-boxes; 12 and 13, are the piston and rod of the condensing cylinder (14) which is of the same capacity as the steam cylinder; 15, is the passage, through which the condensement and injection water and any air or gas are expelled, at the conclusion of the descent of the piston of the condensing cylinder into the hot well (16) to supply the boiler, and which is prevented returning to the condensing cylinder by the valve (17;) 18, is the passage, with a perforated nozzle, for the injection water to condense the steam beneath the piston of the condensing cylinder, through which passage the injection water passes, when permitted to do so, by the injection regulating valve (19,) which valve is attached by the rod (20) to the steam slide valve (8,) 21, is the passage, through which the condensement and injection water and any air or gas are expelled, at the conclusion of the ascent of the piston of the condensing cylinder, into the hot well as before, and which is prevented returning by the valve (22;) 23, is the passage, with a perforated nozzle, for the injection water to condense the steam above the piston of the condensing cylinder, and through which passage the injection water passes, when permitted to do so, by the injection regulating valve (24,) which valve is attached by the rod (25) to the steam slide valve (9.) The injection pipe leads, as usual, from the external water, but has a branch above and below the condensing cylinder, at figs. 26 and 27.

The following will be the action of the engine. The air will be first expelled by blowing through in the usual way; which done, the cylinders and passages will be filled with steam; and supposing the pistons at the positions shown in fig. A, the steam piston being at the bottom, and the piston of

* I believe it is considered prudent always to carry more coals than are actually consumed.

the condensing cylinder at the top, the lower valves, 8 and 19, being moved to the left by hand-gear, the injection water will flow, in the usual manner, in the direction of the arrows, into the condensing cylinder, under its piston, and make a vacuum by condensing the steam contained therein. The engine is now ready to start, the piston of the condensing cylinder being at the top of the cylinder, and the space below it the vacuum. The steam piston will, therefore, be at the bottom of its cylinder, and the space above it steam. The cranks of each engine will have been set in opposite directions, or at each end of the beam, as shown on our front page. The valves, 9, and 24, fig. A, being moved to the left in the direction of the arrow, the communication, through the passages 5 and 7, will be opened between the upper part of the steam cylinder, and the upper part of the condensing cylinder; and by the same movement, the injection water will flow through the injection passage 23, to the upper part of the condensing cylinder, to condense the steam as it is entering from the top of the steam piston. By the same movement, the valves, 8 and 19, are moved in the direction of the arrow to the right, by which the communication is also opened between the boiler, by the passage 10 and 4, to the under side of the steam piston. The injection water under the piston of the condensing cylinder will, by the same movement, be cut off by the valve 19. The engine will then commence its full operation by both pistons starting into action, the condensing piston descending, and the steam piston ascending. The under part of the steam piston is, therefore, receiving the full elastic force of the steam from the boiler, and its upper surface is resisted by the steam as it flows into the condensing cylinder to be condensed, as is now the case in the condensers of the present engines. But the communication being open between the upper part of the steam piston and the upper part of the piston of the condensing cylinder, whatever pressure, during the process of condensation, from uncondensed steam that retards the steam piston, will be given out to the piston of the condensing cylinder; and as there will be throughout a more perfect vacuum on the other side of this piston, than can now be obtained in the condenser of the present engine, even at the termination of the stroke, the same effective pressure will, in reality, be obtained as if the steam piston itself commenced its stroke with a perfectly exhausted or vacuous cylinder. The steam piston having arrived at the top, and the condenser piston at the bottom, of their cylinders, all condensement and air, produced by the admission of the first injection, are expelled by the downward stroke of the condenser piston, through the passage (15) to the hot well. Whilst the downward stroke of the condenser piston was being made, the steam was entering the upper part of the condensing cylinder, from the steam cylinder, as before observed, and was being condensed by the injection water, through the passage 23; and by the time the condenser piston arrives at the bottom, will be completely annihilated. This forms that excellent vacuum which will be obtained by this engine, ready for the next reversal of the piston to *begin* with. The eccentric will now, in the usual way, reverse the valves, by which a communication will be made between the boiler and the upper part of the steam piston, and between its under part and the under part of the condenser piston, whilst, by the same movement, the injection passage at the top will be shut, and that at the bottom of the condenser piston opened. The upper part of the steam piston will then receive the full steam pressure, and its under part, and the under part of the condenser piston, will be placed in equilibrium, as before was the case with the upper parts, by the vapour between them, whilst the injection is condensing the steam under the piston of the condenser cylinder.

If found more advantageous to have still less injection water and liberated air to expel, the condensing cylinder will be enclosed in a tank, and cold water be kept circulating through it by the present supply-pump, which will not be required by the adoption of Pilbrow's boiler-supply, described at page 65.

Fig. B, represents the D valve, with the centre passage stopped up, which is then applicable to this engine, as follows:—1, represents part of the steam cylinder; 2, part of the steam piston; 3, part of the condenser cylinder; 4, part of the condenser piston; 5, the steam passage from the boiler: 6, the valve, or part which usually has a passage through it, but here must be solid; 7, is, alternately, the steam and eduction passage from the lower part of the steam cylinder; 8, the passage to the lower part of the condensing cylinder; 9, is, alternately, the steam and eduction passage to the upper part of the steam cylinder; and 10, is the passage to the upper part of the condensing cylinder. These valves, being worked by the eccentric, will perform the required duty; and, if used, the injection regulating valves must be attached thereto by a bell-crank lever, in a manner similar to what is shown in the valves to the engine in drawing C.

Whether Mr. Pilbrow's valves or these D valves are used, the injection water will not need the attention of the engineer, in case of the stoppage of the engine, or the variation of its speed. He must first set the usual cock, to allow the proper quantity of water

to pass through the injection pipe to the regulating valves, and the admission and exclusion of the injection water will afterwards be regulated by the speed of the engine, and stop when that stops, and continue when it again commences.

Arranged to pass the centres with one Engine.

By an arrangement of this engine, as shown at Fig. C, it will pass the centres, or dead points of the crank, with only one engine. It is the same, in other respects, as the engine before described, with the following difference:—that the condenser piston will only be at its half stroke when the steam piston is at the top or bottom, and the reverse of its cylinder. A double set of valves are also necessary, and must be worked by two eccentrics, so arranged as to admit of the steam passing, alternately, to the upper and under side of the condenser piston, as well from the top as from the bottom of the steam cylinder. For instance, the piston of the condensing cylinder is shown at half its stroke descending, the steam piston (1) being at the bottom at a dead point. The valves being shifted, the steam passes from the boiler to the under side of the steam piston, and the steam above it, which urged it down, will pass by the valves 3 and 4, to the upper side of the condenser piston, and urge it down, a vacuum having been made below it, by the usual injection through the passage and regulating valve, 9. When the condenser piston arrives at the bottom, the valve, 4, will be shut; which, therefore, prevents the whole of the used steam entering the top of the condenser piston. The valve, 6, will be at the same time opened, the other valves remaining as they were, when the rest of the vapour above the steam piston (which had not wholly escaped) will pass by the passage, 10, to the under side of the condenser piston, the upper side of which has become a vacuum, by the injection water through the regulating valve, 11. The steam piston having then arrived at the top, the steam valve, 7, and the eduction valve, 8, will be opened, and the steam valve, 5, and the eduction valve, 3, will be shut, the valves 4 and 6 remaining as they were. Thus the used steam will escape from the under part of the steam piston to the under part of the condenser piston, forcing it upwards. In this way the valves would be varied at every half stroke of the engine, and enable it to pass the centres. The condensement will be thrown out through the passages 12 and 13, in the same way as described in referring to fig. A.

The engraving on our front page represents a compact arrangement of the engine first described, when adapted for marine purposes, where side levers are preferred. For land and Cornish engines Mr. Pilbrow recommends that the condensing cylinder, of the same size as the steam cylinder, should be placed immediately under it, the present air-pump and condenser being dispensed with. The piston and rod of the condensing cylinder may be attached in any convenient way to a cross head on the steam piston rod, or to the end of the working beam. The object in applying this principle to the Cornish engine is this—a better vacuum will be procured by sweeping out the condensement at every stroke; and though Cornish engines get a better mean cylinder exhaustion than rotative engines, still they cannot ensure a perfectly exhausted cylinder from the commencement of the stroke, an equivalent to which will be obtained by the engine, and thus carry out the expansive principle still further than can now be done, even in Cornish engines.

Boiler-supply.

Fig. E represents a very happy and ingenious method of supplying high or low-pressure boilers with water, without any force-pump, but in a way which takes no duty from the engine. Of all the plans I have seen, it is the most philosophical, simple, and efficient. 1 is a section of part of a steam boiler; 2, the supply pipe, leading from the hot well or cistern of supply, which need not be on a level with the feed, because the steam in the boiler will cause a vacuum by being condensed by the water of supply, which will be forced in by the atmosphere, as it is in the condenser; 3 is a metal bracket, fastened to the inside of the boiler, which must be adjusted to the water level; its upper surface is ground smooth, and upon it works a hollow slide, or box, 4, which has its lower edges and surface ground, so as to make a steam-tight joint when sliding on the bracket, 3; this bracket, for sea-going vessels, must be carried into the middle of the boiler, where the water always maintains the same level, however much the level of the whole may be disturbed; 5 is a rod attached to the slide, passing through a stuffing-box, 6, in the boiler, communicating to any convenient part of the engine or machinery, to be worked backward and forward by it. The following is its operation:—The slide, being in the situation shown in the drawing, E, the hollow space, 7, will be filled with water from the hot well through the pipe, 2; and the engine, pushing this slide towards Fig. 8, by the rod, 5, the slide then takes the situation shown by the dotted lines, and the water will fall out of the hollow, 7, into the boiler. When the surface of the water, shown by the line 9, rises to the level of the bracket, the water will not then leave the hollow slide, but be carried back again, until the water has fallen, the slightest degree, below the level, to permit it to fall out; so

that the water can never rise above its proper level in the boiler, nor sink below it, during the action of the engine. Having discharged its water, the hollow slide will return, full of steam, to its former position by the motion of the engine; and, meeting, with the water as before, the steam will be condensed, and the hollow, 7, be again filled and again supply the boiler, by the action of the engine. The foot of the slide, 10, will cover the orifice of the supply pipe while the water is being discharged into the boiler, and thus prevent the steam blowing out through the supply pipe, and by its effort to do so, will press down the foot of the slide, and thus prevent the slide pitching over when so much off the bracket. The hollow of this slide must be made of such capacity as to contain much more water than is evaporated at each stroke, which will soon make up for any deficiency by blowing out, or by blowing off at the safety-valve; but, as before observed, can never over-feed the boiler.

MR. ADCOCK'S PATENT SPRAY PUMP.

[Abridged from a Report in the *Liverpool Courier* of a communication made by Mr. Adcock to the Liverpool Polytechnic Society.]

Mr. Adcock stated, that his mind had been impressed, for some years past, with the difficulties and heavy expenses attendant on the present systems of pump-work, but that it was very far from his wish to disparage what has hitherto been done by others, or to undervalue, in however minute a degree, the great mechanical knowledge, and high scientific acquirements, which have been devoted to this subject. "On the contrary, sir," said Mr. A., "I could wish it most distinctly to be understood that, in so far as regards the present mode of raising from mines, *in a solid mass*, by pump-work, I do consider that our mining engineers, and especially those of Cornwall, have carried this branch of mechanics to quite as high a state of perfection as any other branch of the same science has been carried by other individuals, in the several other processes of productive industry. But it should be stated that, in the other branches of productive industry, as in the cotton, silk, woollen, flax, lace, hosiery, and iron manufactures, the various mechanical arrangements, their improvements and extension, *being above ground*, are placed prominently before the public eye; while those of the miner, *being beneath the surface of the ground*, are unseen and but little known beyond the immediate districts of their application. Nevertheless, we have an unerring test as to the value and efficiency of the improvements introduced into pump-work, by the knowledge we now possess of the greater depths to which mines can be worked, and the much greater quantities of water that can be raised from them than was done formerly."

At the Consolidated and United Mines, in Cornwall, for example, where the steam-engines that work the pumps make, on the average, eight strokes per minute, the quantity of water raised from the depth of the mine, equal to 180 fathoms, is not less than 3,800 gallons per minute. Hence, as the gallon is 10 pounds, and the fathom 6 feet, the quantity of water raised per minute is not less than 38,000 pounds, or about 17 tons weight, from a depth of 1,080 feet. If, therefore, the water so raised were allowed to flow at an average speed of 1 foot per second, or 60 feet per minute, it would form a rivulet 5 feet wide and 2 feet deep; and to raise that quantity of water per minute from the depth of the mine, not less than 2000 horses of steam-engine power are employed, viz:—

3	engines, with cylinders		90 in. diameter each.	
3	ditto	ditto	85	ditto.
1	ditto	ditto	80	ditto.
2	ditto	ditto	65	ditto.
1	ditto	ditto	30	ditto.

Each steam-engine working upon the high-pressure, expansive, condensing system.

Again, at the Mold Mines, in Flintshire, the quantity of water raised is more than double the amount of that at the Consolidated and United Mines, or about 8,000 gallons, or 35¾ tons weight, per minute; but then the depth from which the water is raised is not so great, being, on the average, only 50 fathoms, or 300 feet. In other words, and to compare the effect with that of the Consolidated and United Mines, in Cornwall, the quantity of water raised *per minute* from the Mold Mines, and from a depth of 300 feet, is sufficient to make a rivulet 10¾ feet wide and 2 feet deep, flowing, as in the former case, at the rate of 1 foot per second, or 60 feet per minute, and to raise this large quantity of water per minute there are employed 8 steam-engines and 4 overshot water-wheels, viz:—

1 engine, with	80 in.	cylinder and	22 in.	pump.
ditto	66	ditto	22	ditto
ditto	64	ditto	18	ditto
ditto	63	ditto	18	ditto
ditto	60	ditto	18	ditto
ditto	46	ditto	16	ditto
ditto	40	ditto	12⅛	ditto
ditto	36	ditto	10	ditto

And the overshot water-wheels are each 40 feet diameter, and 4 feet 8 inches wide, working a 22-inch pump, and 3 pumps each, 18 inches diameter, being one pump to each water-wheel.

The enormous weight of materials in a deep pit is far greater than persons unaccustomed to such investigations could possibly imagine. In illustration of which, said Mr. A., I will now exhibit to the Society the weight of materials for the pit-work of the

80 inch cylinder engine, at the Consolidated and United Mines in Cornwall, to which I have before had occasion to allude:—

		tons.
Weight of pumps,	windbore, &c.	161½
,,	woodwork	50
,,	moving work	26
,,	pump rods	4 ¼
,,	main pump	94¾
,,	four balances & water lifts	96½
,,	load of water in pumps	38⅜

In my prior statement, said Mr. Adcock, respecting the Consolidated and United Mines, I mentioned the depth of the mines to be 180 fathoms, or 1,080 feet. But I should state, that such is the average depth from which the various pumps lift the water, and that some of the pumps lift from greater depths than others. The pumps under consideration, *for example*, lift the water from a depth of 290 fathoms, or 1,740 feet. At this pit there were, and probably are, twelve lifts, or pumps, the one below the other, with a length of stroke equal to 8¾ feet, and making, on the average, 6½ strokes per minute. The water raised at each stroke, and discharged at the top of the mine, was equal to 32½ gallons, or 325 pounds weight; and to raise that quantity of water, *at each stroke*, 300 tons had, each time, to be put in motion, and its *vis inertiæ* to be overcome. Hence, said Mr. Adcock, from what I have stated as regards the great weight of materials, and the large-sized steam-engine employed, it must be perceptible to every one, that the outlay for such a set of pump-work is severely great; and that any considerable reduction of the cost, and the subsequent annual expenses, cannot be regarded otherwise by the miner, than as a great boon conferred upon him.

Mr. Adcock here developed the several successive steps of the progression of his improvements, until, eventually, the complex ideas he originally had were reduced to the present state of perfection, as illustrated by his Patent Spray Pump.

"About two years ago," said Mr. A., "I secured a patent in England, for a new and very peculiar process of raising water from mines and other deep places, by employing the force of *condensed air*, confined within a cylinder, and alternating in its pressure, by the action of the piston within that cylinder, from 45 to 90 pounds on the square inch.

"The invention, when it had been perfected, was submitted to the attention of miners of extensive experience, and approved of by them; and an order, which I had received, was in progress of execution, and a considerable outlay had been incurred by the parties, when I found it necessary to put a stop to all further proceedings, in consequence of a far more valuable and practically efficient discovery having been made by me, and which, if I may be allowed to use the words of an engineering friend of celebrity, is '*simplicity itself*.'

"For this last invention, I have secured patents in this kingdom, and in several kingdoms abroad.

"The invention is, as you will hereafter find, of an extraordinary character,—the happy result of an elaborate chain, or course of reasoning; and some of the *Prospective Advantages* of the *Patent* may be thus stated:

1. I employ neither pumps nor pump-rods.

2. There is but *one lift*, whatever the depth of the mine.

3. As there is but *one lift*, I employ neither clacks nor valves.

4. The water-pipes, or pump-trees, are made and put down at little cost: they are made of sheet zinc, bent into shape, soldered, and soldered to one another; hence, flanches and screw-bolts are dispensed with.

5. Being made of sheet zinc, the pipes, of course, are of light weight; and therefore require but few, and very slight, horse-trees to support them.

6. Wear and tear, comparatively speaking, there is none.

7. The steam-engine that I employ is double-acting, and not single-acting. It is of much less size, and of much less power, and there is not occasion to erect it, as in pump-work, at the pit's mouth. On the contrary, one engine may, with facility, be made to work two or three pits, at considerable distances apart.

8. I economise largely in the consumption of fuel; and in tallow, packing, and the leathering of buckets and clacks; also in labour.

9. The ventilation of a mine is produced free of cost. And,

10. In taking up the present plant of a mine, to put down the new, generally speaking, the sale of the old materials will more than repay the cost of the patented apparatus.

"Having thus described to you, gentlemen, in a cursory manner, some of the advantages to be derived from the adoption of the patented apparatus, I will, in the next place, detail the chain of reasoning which led to the discovery.

"In my first patented apparatus, I had, in deep mines, a series of "*lifts*;" the same as in pump-work. Consequently, as in pump-work, I was obliged to employ clacks or valves. Knowing that such clacks or valves are at all times liable to derangement, I was desirous, if possible, to improve the patented apparatus, by substituting a new kind of valve, or one that would lessen the number of those employed. For that purpose, I invented and patented a beautiful, simple, and

efficient valve; which, judging from its simplicity and value, together with its non-liability to go out of repair, must become universal in its application to water-works and steam-engines.

"By that invention, I could make one valve perform the duty of four clacks; and the water-way, which, in the patented valve is unobstructed, was of the same size as that of the pump-trees.

"Encouraged by the success I had thus experienced, I was emboldened to attempt a still further improvement of the patented apparatus, by endeavouring to lessen, even to a greater extent, the number of clacks employed. Eventually, I proposed to myself the question—'*Is it possible, in the raising of water from mines and other deep places, to do without clacks or valves altogether?*'

"I knew this desirable effect could not be produced, if the water had to be raised from the mine in a compact or solid state, as in pump-work. For in a pit, 1,000 feet in depth, the column of water being also 1,000 feet, the pressure of the water against the sides of the pipe at the bottom of the mine, would be about 440 lbs. on each square inch, and no pipe that could be conveniently applied in practice, could resist that pressure,—I therefore, in the next place, questioned within myself, whether the water could not be brought up from the mine in a divided state: and the obvious reply to it was, if the water be brought up in a divided state, it must be in the state of vapour or of rain.

"The chain of reasoning, thus far continued, led me to investigate the descending velocities of drops of rain, compared with what those velocities should be, by the laws of gravitation; and I found that, by the laws of gravitation, the rain ought to descend towards the earth with a speed constantly accelerating; so that, if the cloud were high from which it fell, it ought by its velocity, and consequently its *momentum*, to inflict evils of a serious nature on all animal and vegetable life.

"Then, how is it that such effect is not produced?

"Simply, by the resistance of the air. Each drop of rain, while in the cloud, may be considered to be in a quiescent state. It begins to descend, from a state of rest, with a motion constantly accelerating, and thus it continues, until it acquires a certain amount of speed; from which time forth the motion of its descent is uniform.

"This uniformity of motion is produced by the resistance of the air; by its not being able to flow from beneath the drop beyond certain rates of speed under certain amounts of pressure, and the ultimate amount of pressure being determined by the weight of the drop. Hence, the drop descends with an accelerating speed at first, compressing the air more and more immediately beneath it, until the resistance and the compression become equal to the weight of the drop—thenceforward its motion is uniform.

(To be concluded in our next.)

THE "SUGGESTIONS FOR ESTABLISHING A FIRE-POLICE IN DUBLIN."

Sir,—In some recent numbers of your Magazine, a paper has been re-published from the *Citizen*, a periodical of this city, on the establishment of a Fire Police, &c., for Dublin. This paper, which carries only an initial signature, and whose author is quite unknown to me, appears to have attracted some notice from its transference to your pages. As the original promulgator, therefore, of the principal ideas contained in it, I beg permission to assert my claim to priority in the whole project.

In the chief mercantile paper of this city, *Saunders's News Letter*, I published a letter on the 28th of April, 1837, immediately after the burning of the Royal Arcade, in College Green; and on the 30th of September, 1840, after another fire, I published a second letter in the same paper upon this subject. These two letters will be found to include every suggestion of any value that has been published up to this time, relative to the means of preventing and extinguishing fires in Dublin. On the publication of the latter communication, I was favoured by the Commissioners of Metropolitan Police with the following letter:—

"Metropolitan Police Office, Castle,
"3rd October, 1840.

"Sir,—I am directed by the Commissioners of the Metropolitan Police to acquaint you with reference to the communication addressed by you to the Editor of *Saunders's News Letter* on the 30th ult., that they have attentively considered the plan recommended by you for the formation of a Fire Brigade in this city, and I am instructed to inform you that they highly approve of the suggestions you have offered, and fully coincide with you in the view you have taken of the subject, and it is the intention of the Commissioners to recommend to Government the introduction of a Bill into Parliament to enable them to carry the object proposed into effect.

"The Commissioners trust that on the necessary legislative enactment being obtained, you will favor them with the benefit of your opinion and advice with regard to the

regulation and organization of the establishment in question.

"I have, &c. &c.,

"Your most obedient servant,

(Signed) "J. A. Bowles,

"Secretary.

"Robt. Mallet, Esq., Asst. Inst. C.E."

A distinguished Roman historian recorded his opinion that, if it be glorious to die from the common weal, *etiam benedicere haud indecorum est*. If, therefore, there be any credit due for these suggestions, or any value in what has been proposed, I claim as my own its origin and authorship.

I am bound to presume the unknown author of the paper in the *Citizen* to have been ignorant of my letters—but being so, the striking coincidence of the writer's views, with my own, gives additional force to my suggestions. As possibly at some future period, another generation may question, who first promoted the establishment of a Fire Police in Dublin, I have ventured thus (at some risk of the charge of egotism,) to assert my claim to it in a permanent form through the medium of your pages.

I am further in a position to state that, the proposed Fire Establishment, is only now delayed, by the expectation that the New Municipal Corporation of Dublin will apply itself to the preliminary measure of obtaining an efficient supply of water in the streets.

I am, Sir,

Your most obedient servant,

Robert Mallet.

91, Capel-street, Dublin, May 14, 1841.

P. S. I send copies of my two letters alluded to for your perusal, and republication if you think proper.

[We have perused the two communications published in "*Saunders's News Letter*," referred to by our esteemed correspondent, which most completely establish the justice of his claim to originality in the suggestions for improving the water supply, and the establishment of a fire police in Dublin, down to the minutest details. Want of space precludes our publishing these letters; besides the subject matter of them is embodied in the article recently quoted from the *Citizen*, the distinguished writer of which must, we are confident, have been ignorant of the labours of Mr. Mallet, and will, we are equally sure, be highly gratified in finding so able a coadjutor in the "good cause." Ed. M. M.]

THE SMOKE NUISANCE.

Sir,—Your indefatigable correspondent, Mr. Dircks, states that in the absence of experiment, my suggestion to condense smoke on Jeffrey's principle "goes for nothing," because he "very much doubts" that the plan would have the desired effect; and at the same time, in his letter from the *Liverpool Mercury*, he declares that my "bold assertions" in describing his *experimental* furnace, also "go for nothing." Indeed every thing goes for nothing with Mr. Dircks, for as the drummer said, "strike high or strike low there is no pleasing him." He complains of the language I used in the two or three prefatory lines I addressed to you with my last communication, strangely enough describing it to be only such as "a weak cause can at all palliate." Now if a weak or bad cause can *palliate* bad language (although in my simplicity I confess I had always thought the reverse) what are we to think of the weakness of his own cause, when he politely calls my letter "a tissue of gross misrepresentations," &c. &c.—bearing in mind that I am the party attacked, and that every allegation I advanced respecting his own experimental furnace is capable of proof by the best of all evidence, that of the furnace itself. But I can easily afford to forbear recrimination, as well as to discontinue bandying letters with *him*, which must be anything but pleasant to your general readers, served up as they are at second-hand from the columns of a newspaper, notwithstanding this *scissors and paste* correspondence is supported on his side by the money weight and influence of counsellor Williams and the City of Dublin Steam Packet Company—Mr. Dircks himself only being thrust forward as a sort of outpost—and therefore not worth powder and shot while better game is up.

I am, Sir,

Yours, most respectfully,

R. Armstrong.

London, May 24, 1841.

[This controversy, which has become of too personal a character to be continued with advantage, must here close. Ed. M. M.]

SOLUTION OF KINCLAVEN'S QUESTION.

Sir,—I send you a solution of Kinclaven's mathematical question, proposed in No. 914 of your valuable and scientific journal.

I am, Sir,
Your obedient servant,
JNO. NELSON.

May 3, 1841.

Let x=gross revenue before it was increased, and y=interest of the National Debt; then by the third condition of the question $\frac{x}{1\frac{7}{9}}$ or $\frac{9x}{16}$ = revenue when reduced, and by the fourth condition $\frac{9x}{16} - y - 4000000$ or $\frac{9x-16y-64000000}{16}$ = to the expense of collecting $\frac{9x}{16}$ of gross revenue, and by the last condition

$$\sqrt{\frac{9x}{16}} : \sqrt{x} \text{ or } \frac{3}{4} : 1 : \frac{9x-16y-64000000}{16} : \frac{9x-16y-64000000}{12}$$

= expense of collecting x of gross revenue ∴ $x - y - \frac{9x-16y-64000000}{12}$ or $\frac{3x+4y+64000000}{12}$ = available sum produced from x of gross revenue; hence, $\frac{3x+4y+64000000}{12} : 4000000 :: 7\frac{2}{3} : 1$ or $3x + 4y + 64000000 = 368000000$ ∴ $x = \frac{304000000-4y}{3}$.

Again, $2\frac{1}{4}x$ or $\frac{9x}{4}$ is the gross revenue when increased in the ratio of $2\frac{1}{4} : 1$

$$\text{hence, } \sqrt{x} : \sqrt{\frac{9x}{4}} \text{ or } 1 : \frac{3}{2} :: \frac{9x-16y-64000000}{12} :$$

$\frac{27x-48y-192000000}{24}$ = expense of collecting $\frac{9x}{4}$ of gross revenue ∴ $\frac{9x}{4} - y - \frac{27x-48y-192000000}{24} = \frac{9x+8y+64000000}{8}$ = available sum produced from $\frac{9x}{4}$ of gross revenue.

Lastly, $\frac{9x+8y+64000000}{8} : \frac{3x+4y+64000000}{12} : 3\frac{12}{23} : 1$; from which we obtain $x = \frac{32y+1984000000}{45} = \frac{304000000-4y}{3}$; from which equation we find $y = 28000000$, and $x = \frac{304000000-112000000}{3} = 64000000$ ∴ the gross revenue before the increase was £64 millions, and the interest of the national debt £28 millions.

J. N.

EXPERIMENTS WITH RENNIE'S PADDLES.

In our last number we stated that a preliminary trial had been made with the trapezium paddle wheels fitted to H.M. steamer *African*, and that the results had been very satisfactory.

We now present our readers with the results of the subsequent experiments, all of which have been attended with the same success.

The *African* is one of that class of ten-gun brigs which was built during the late war, she was afterwards lengthened about 10 feet and converted into a steam vessel. Her build is full both fore and aft, and her midship section immersed is a semi-ellipse, of which the transverse axis 24 ft. 10 in., and the conjugate axis about 10 ft., her length is about 109 ft. 10 in. or little better than four to one of the midship breadth, which, as compared to the proportions of our modern steamers is ill calculated for speed. Accordingly with a power of 90 horses, or one-third of the tonnage, her velocity at an immersion 9 ft. 4 in. has rarely exceeded nine per hour.

In the year 1837 a series of experiments were made by Mr. Kingston, by order of the Lords of the Admiralty, under the following circumstances.

Mean draughts of the vessel 9 ft. 4½ in., diameter of the paddle wheel 14 ft. 7 in., twelve rectangular boards in three slips, each placed in a cycloidal curve, 7 ft. in length and 1 ft. 9 in. in width, thus presenting a total area immersed, of 65 square feet, but an effective area of 57 to 60 square feet for both wheels, while the area of the midship section of the vessel varied according to the depth of immersion, from 140 square feet to

160 square feet, or nearly in the ratio of one foot of paddle board to three feet of midship section.

The average of six experiments with and against the tide opposite the measured mile at Long Reach, gave a velocity of 9.174 miles per hour through still water. The engines made from 29 to 30 revolutions per minute, and the barometer gauge indicated a vacuum in the condenser of 26¾ inches.

Experiments made with the Trapezium Paddle Wheels.

The first trial was made on the 14th of April last. The greatest number of revolutions made by the wheel was 23½, and the speed of the vessel was 9·1 miles an hour. The extreme diameter of the wheels from point to point was 19 feet, and the total immersed area of the floats was about 34 square feet, or better than one-half of the surface of the rectangular floats; and a second trial was made on the 21st following, but the number of revolutions of the engines did not exceed 23, and the velocity 8¾ miles. The third trial was made on the 1st instant, with a slight reduction of a square foot in the area of the floats, and by reefing them up 4 inches. The greatest number of revolutions made by the engines was 25½, and the greatest velocity of the vessel was 9·022 miles. A fourth experiment was made on the 8th instant, with 25 revolutions of the engine, and 8·8 miles per hour obtained; and lastly, by reducing the floats to an immersed surface of 22 square feet and by reefing the floats 11 in. or 22 in. in all, so as to reduce the diameter of the wheels to 17 feet, the result was 27½ revolutions, and a velocity of 9.124 miles per hour. The vacuum gauge varied from 25 to 26, which is equal to the vessel's performance in the year 1837, and with from 2½ to 3 revolutions less of the engines,—(scarcely yet arrived to their full state of perfection and having only just undergone a repair), and with all the disadvantages of wide canvass, paddle boxes, and a foul bottom. Making due allowance therefore for the above contingencies, it is now fairly proved that the trapezium paddle of half the width, of half the area, and half the weight, and half the cost of the common paddle wheel, will produce the same, if not a greater mechanical effect in propelling vessels through the water, but that it will in the opinion of nautical men supersede the common paddle wheel, on account of its greater simplicity and *snugness* in all seagoing vessels.—*Nautical Magazine.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

Charles Wye Williams, of Liverpool, Gentleman, *for certain improvements in the construction of furnaces and boilers.* Petty Bag Office, May 17, 1841.

The first improvement consists in inserting metallic pins in the plates of which boilers, evaporating pans, &c., are made—part of each pin extending through the bottom of the boiler, &c. into the liquid to be heated or evaporated, while the lower part projects into the fire. By this means the quantity of heating surface is materially increased, and a larger quantity of caloric consequently transmitted to the fluid.

The second improvement relates to the fire-bars of the furnace, which are serrated, the elevated portions being wedge-shaped and the depressions smooth, and incline downwards from the fire-door towards the bridge of the furnace, their lower ends resting on a bar, on which they are capable of being moved. The other ends terminate under a hopper outside of the fire-place, but within the fire-door; the bars are supported at this end by eccentrics on a horizontal shaft, which being turned (by hand or by gearing from the engine) gives a vertical motion to the fire-bars, by which means the fuel falling upon them from the hopper is gradually urged towards their inner ends and spread evenly over the surface of the fire-grate, and the formation of clinkers is prevented.

The claim is, 1. To the use and application of metallic pins as conductors for transmitting heat.

2. To the mode of giving the longitudinal and vertical movements to the fire-bars of a furnace; also the extension of the fire-bars outside of the furnace, so as to receive fuel from a hopper and spread it evenly over a fire-grate.

Joseph Whitworth, Engineer, and Joseph Spear, Gentleman, both of Manchester, *for certain improvements in machinery, tools, or apparatus for cutting and shaping metals and other substances.* Petty Bag Office, May 17, 1841.

The first of these improvements relates to cutting screws by means of dies formed from the ordinary die by dividing it into two equal parts, the plane of section being parallel to the sides of the die; or into three unequal parts, the two planes of section being parallel with each other but inclined to the sides of the die.

In using this die, its plane of direction instead of passing from the axis of the shaft on which the thread is to be cut, to the centre line of the die (as in ordinary dies) passes outside of this line. An improved stock of

simple construction is shown for holding these dies.

The second improvement refers to a new mode of actuating the planing machine patented by Mr. Whitworth in 1839.

The third improvement relates to slotting machines, the chief feature of which is a compound table, consisting of three parts, the lower part sliding on the bed of the machine, the middle part moving at right angles to the lower one, and the upper part having a rotary movement.

The fourth improvement is in the slotting bar, which has an angular groove cut down its back to receive a strip of metal tapped for small set screws, for adjusting the position of the cutters. In the front of the bar recesses are cut out round the cutters to afford room for the cuttings.

The fifth improvement is in the slide lathe, and consists in attaching to the headstock an apparatus for the purpose of forming together with the change-wheels, a more perfect communication between the mandril and guide-screw.

Sixthly, an apparatus for "truing up" railway carriage wheels:—one end of a connecting-rod is attached by a stud to the outside bearing of each wheel below the axle; the other ends of these rods are fastened to a horizontal bar parallel with the axle; on this bar a second bar slides composed of two parts, its outer ends carrying a grinder or cutter placed opposite to and in contact with the tire of each of the wheels.

The inner ends of the sliding bar are connected by an eccentric pin, which passes through them and is fastened on a horizontal wheel which is turned by a band from a small pulley on the axle of the running wheels.

Motion being thus communicated to the horizontal wheel, by means of the eccentric pin, it causes the two parts of the sliding bar to traverse backwards and forwards, by which means the grinders or cutters are caused to traverse over the tires of the wheels as they revolve, and so remove any inequalities that may exist on their surface.

Alexander Stevens, of Manchester, Engineer, *for certain improvements in machinery or apparatus to be used as a universal chuck for turning and boring purposes.* Petty Bag Office, May 19, 1841.

This chuck is formed of a front and back plate: in the former there are three radial mortices; three holding dies are screwed to dove-tail slide-pieces which slide backward and forward in the mortices. A nut is formed in one of these slide-pieces, in which a screw works, its outer edge being supported in a bearing on the edge of the front plate, so that on turning the screw, the slide piece will traverse to and fro in its mortice. To each slide-piece is attached a straight lever, its other end being attached to an equilateral triangular lever, working loosely on the centre boss of the chuck. By this arrangement, on turning the screw with a suitable key, the slide-pieces will advance to or recede from the centre simultaneously, thus grasping and holding the object to be turned.

The patentee claims the peculiar and novel arrangement of apparatus constituting a universal chuck, without confining himself to the number or dimensions of the levers working on the central boss.

William Henson, of Allen Street, Lambeth, Engineer, *for improvements in machinery for making or producing certain fabrics with threads or yarns, applicable to various useful purposes.* Petty Bag Office, May 19, 1841.

These improvements relate to warp machiney, and are briefly as follows. The warp roller being mounted in bearings on the upper part of the machine, the threads or yarns pass from the warp-roller through a couple of stationary guides or stays, thence through a number of moveable guides to the needles. When a wide fabric is to be produced, the threads which form the selvages, are carried by bobbins at the top of the machine; but when narrow fabrics are to be made, these bobbins are placed at proper intervals along the front of the machine. The needles are cast in leads and are attached to the needle bar in the usual manner, but the needles are placed vertically in this machine. At proper intervals, the presser-bar presses against the beards of the needles as in ordinary warp machinery.

The threads or yarns are lapped round the needles, by the motion of a series of moveable guides placed directly over them; these guides are leaded in the ordinary way, and screwed to the guide bar. A series of hooks or crutches, corresponding to the sinkers of the ordinary warp frames, and effecting a similar purpose, are cast in leads like the guides or needles, and are placed in front of the needles. The leads of these hooks are screwed to a longitudinal vibrating bar, mounted on rocking levers, a hook being opposite to every space in the row of needles. This hook bar forms a breast beam, over which the manufactured fabric passes on its way to the work roller.

John Condie, Manager of the Blair Iron Works, Ayr, Scotland, *for improvements in applying springs to locomotive, railway, and other carriages.* Rolls Chapel Office, May 26, 1841.

These improvements include several ingenious modes of applying springs, or springs and levers, in such a manner as not only to give all the benefit and advantages afforded

by the methods now in use, but also to effect the uniform continuity of the pressure made to bear on the driving or other wheels of locomotive and other carriages, and promote the constant adhesion of the driving or centre wheels to the rails.

The patentee shows the application of the principle in four different ways, differing principally in the position of the spring. In the first of these, which is a six-wheeled locomotive engine, the carriage is supported on four points of bearing, two on each side the frame; on each of these axes or points of suspension are placed a lever; a strong spring is placed on each side of the frame, midway between the smaller wheels; to either end of this spring, one end of each of the before mentioned levers is attached. The spring is applied to the bearing of the driving wheels by a spring-pin or bearing-rod, and the elasticity of the spring is communicated to the other wheels by bearing-rods from the opposite ends of the levers to those which are attached to the spring; the motion of the two levers being equalized by means of a horizontal rod. From this arrangement it will be evident that the quantity of weight borne by the driving wheels will depend on the position of the axis of the levers, whether they are nearer to or further from the ends of the bearing lever by which they are attached to the spring. So that in carrying out this invention the axis of the levers is to be placed at a greater or lesser distance from the end levers according to the degree of weight desired to be borne by the several wheels. The patentee does not confine himself to any of the precise arrangements shown, but claims the mode of applying springs to locomotive, railway, and other carriages, whereby the desired proportions of the weight having been caused to bear on the driving or other wheels, the uniform continuity of that proportion is effected, and the constant adhesion of the driving or centre wheel to the railway or road is promoted.

RECENT AMERICAN PATENTS.

[From Dr. Jones's List in the Journal of the Franklin Institute, for February, 1841.]

For a Machine for Separating Corroded and Uncorroded Lead; *Edward Clark, Saugerties, Ulster county, New York, December 5.*—The semi-corroded lead is to be passed between rollers, furnished with grooves, or checkered, so that the uncorroded lead will be stretched, or bended, and again straightened, and thus the corroded parts be separated from that which remains metallic.

The machine is to be put in motion so that each individual roller will turn inward upon its fellow, and downward; and the lead is to pass through between these rollers in a crimped state to the next series, and so on, when it falls upon an endless apron, and is carried away to be again subjected to the corroding process.

The claim is to the combination of plain and grooved rollers, and also the revolving apron, brushes, and scrapers, &c.

For Manufacturing Needles; *Abel Morrall, Great Britain, December 21.*—"My improvement in making or manufacturing needles, consists in an improved mode of clearing and finishing the eyes of sewing needles, by removing any burs, feathers, or sharp edges from the insides of the eyes of such needles which, without being so cleared and finished, would be subject to cut the thread in the operation of sewing." "The invention consists in the spitting or stringing of needles upon a steel or other wire, or any suitable substance which may be passed through the eyes thereof, and which either by means of edges or teeth formed thereon, or by the application of some grinding or polishing material thereto, shall remove the asperities from said eyes, and render them perfectly smooth, by giving to said needles, while so strung, a shaking or reciprocating motion, as set forth."

NOTES AND NOTICES.

Lilliputian Steamer.—On Monday, a beautiful little steam-vessel, worked on an entirely new principle, arrived at Lincoln, on her way to Nottingham, and excited very great curiosity. The belief was very generally entertained that the Archimedean screw formed the propelling power, but that is not the fact, the invention being entirely new, and possessing many advantages over the screw referred to. There are two small paddles at the stern, and the machinery is worked by straps and friction pulleys, so arranged as to avoid the wear and tear of gears. This handsome model of a steamer, named the *Jane*, is only 26 feet long, with five feet beam; her burden is less than three tons, and her steam power less than one horse: in calm water she attains a speed of seven miles an hour, and, which is an immense recommendation for the navigation of narrow rivers and canals, she makes scarcely any perceptible swell. The inventor and patentee (Mr. G. Blaxland, of Greenwich) expended a considerable sum of money in experiments before bringing his invention to its present state of perfection, but we doubt not that he well be amply repaid by the extensive demand which must take place. Mr. B., accompanied by captain Fairbairn and another friend, steamed their way in this miniature craft from London to Boston, in a heavy sea, and with a head wind. The *Jane* left London on Thursday afternoon, and, there being of course no room for berths, she was brought up that night at Southwold; next day she reached Blakeney, and on Saturday arrived safely at Boston: on Monday she left the latter place for Nottingham, passing through Lincoln on her route the same day for Nottingham, the Trent Steam Company being desirous to inspect her.—*Hull Advertiser.*

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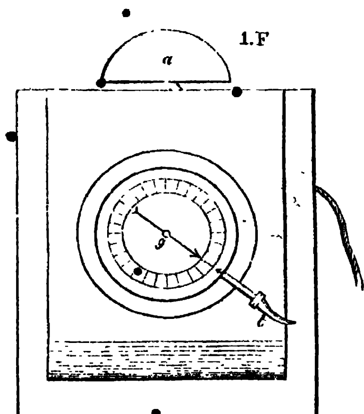
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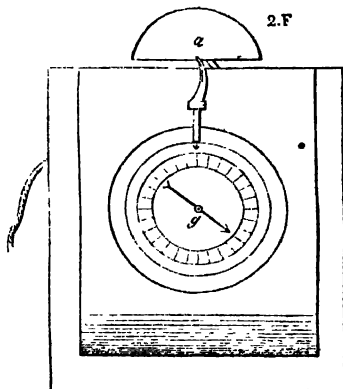
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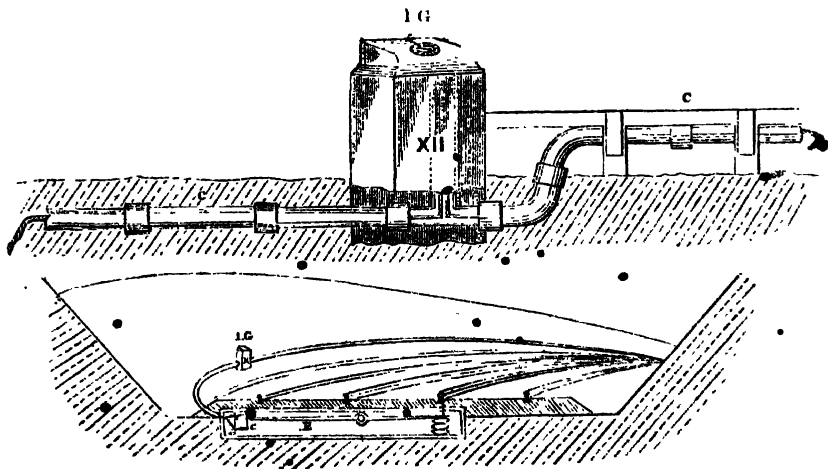
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COOKE AND WHEATSTONE'S ELECTRIC TELEGRAPH.







COOKE AND WHEATSTONE'S ELECTRIC TELEGRAPH.

We published in our 886th number a very full account of this valuable invention—compiled from the Fifth Report of the Parliamentary Committee on Railways—and on that occasion ascribed the invention equally to Professor Wheatstone and Mr. Cooke, in whose names the patent for it runs. Public opinion, however, having with its customary injustice in the case of inventors, chosen to assign all the merit to one of these gentlemen only, to the prejudice of the other, two mutual friends, Sir Marc Isambard Brunel, and Professor Daniell, were very judiciously called in to adjust the respective pretensions of the parties, and after a full inquiry into the circumstances connected with the invention, these highly respectable, and most competent referees drew up the following statement, with which, we are glad to learn, both Professor Wheatstone and Mr. Cooke are entirely satisfied.

"*Statement.*

"As the Electric Telegraph has recently attracted a considerable share of public attention, our friends, Messrs. Cooke and Wheatstone, have been put to some inconvenience by a misunderstanding which has prevailed respecting their relative positions in connexion with the invention. The following short statement of the facts has, therefore, at their request, been drawn up by us the undersigned Sir M. Isambard Brunel, Engineer of the Thames Tunnel, and Professor Daniell, of King's College, as a document which either party may at pleasure make publicly known.

"In March, 1836, Mr. Cooke, while engaged at Heidelberg in scientific pursuits, witnessed, for the first time, one of those well-known experiments on electricity, considered as a possible means of communicating intelligence, which have been tried and exhibited from time to time, during many years, by various philosophers. Struck with the vast importance of an instantaneous mode of communication to the railways then extending themselves over Great Britain, as well as to government and general purposes, and impressed with a strong conviction that so great an object might be practically attained by means of electricity, Mr. Cooke immediately directed his attention to the adaptation of electricity to a practical system of telegraphing; and, giving up the profession in which he was engaged, he, from that hour devoted himself exclusively to the realization of that object. He came to England in April, 1836, to perfect his plans and instruments. In February, 1837, while engaged in completing a set of instruments for an intended experimental application of his telegraph to a tunnel on the Liverpool and Manchester Railway, he became acquainted, through the introduction of Dr. Roget, with Professor Wheatstone, who had for several years given much attention to the subject of transmitting intelligence by electricity, and had made several discoveries of the highest importance connected with this subject. Among these were his well-known determination of the velocity of electricity, when passing through a metal wire; his experiments, in which the deflection of magnetic needles, the decomposition of water, and other voltaic and magneto-electric effects, were produced through greater lengths of wire than had ever before been experimented upon; and his original method of converting a few wires into a considerable number of circuits, so that they might transmit the greatest number of signals, which can be transmitted by a given number of wires, by the deflection of magnetic needles.

"In May, 1837, Messrs. Cooke and Wheatstone took out a joint English patent, on a footing of equality, for their existing inventions. The terms of their partnership, which were more exactly defined and confirmed in November, 1837, by a partnership deed, vested in Mr. Cooke, as the originator of the undertaking, the exclusive management of the invention in Great Britain, Ireland, and the Colonies, with the exclusive engineering department, as between themselves, and all the benefits arising from the laying down of the lines, and the manufacture of the instruments. As partners standing on a perfect equality, Messrs. Cooke and Wheatstone were to divide equally all proceeds arising from the granting of licenses, or from sale of the patent rights; a per centage being first payable to Mr. Cooke, as Manager. Professor Wheatstone retained an equal voice with Mr. Cooke in selecting and modifying the forms of the Telegraphic Instruments, and both parties pledged themselves to impart to each other, for their equal and mutual benefit, all improvements, of whatever kind, which they might become possessed of, connected with the giving of signals or the sounding of alarums by means of electricity. Since the formation of the partnership the undertaking has rapidly progressed, under the constant and equally successful exertions of the parties in their distinct departments, until it has attained the character of a simple and practical system, worked out scientifically on the sure basis of actual experience.

"Whilst Mr. Cooke is entitled to stand alone as the gentleman to whom this country

is indebted for having practically introduced and carried out the Electric Telegraph as a useful undertaking, promising to be a work of national importance; and Professor Wheatstone is acknowledged as the scientific man, whose profound and successful researches had already prepared the public to receive it as a project capable of practical application; it is to the united labours of two gentlemen so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made during the five years since they have been associated.

"(Signed) { "Mc Id Brunel.
"J. F. Daniell.

"London, 27th April, 1841."

Mr. Cooke, to whom the office of managing partner is assigned by the preceding statement, has published a very complete set of drawings, with letter press description, showing—1, the application of the Electric Telegraph to tunnels; 2, its application to level crossings, approaches to stations and switches, &c.; 3, arrangement of telegraphs for giving two signals, similar to those in use on the Blackwall Railway; 4, terminal telegraphs for long lines of communication; 5, the electric detector for detecting injury to the wires—and, 6, the air pressure apparatus for excluding water from the tube when carried under ground, and for giving notice of defects in the tubing. We select for extract as most illustrative of our former notice, the details with which we are here supplied, respecting the terminal telegraphs for long lines of communication.

1 F, 2 F (see our front page) are terminal telegraphs, for extensive communications, giving 30 or 60 signals by the pointing of a revolving index-hand at letters on a fixed dial, as in a common clock. The person giving the signal turns the concentric hand (t) till its pointer stands opposite the signal to be given, as shown in 1 F, when, instantaneously, the index-hand (g) in all the corresponding telegraphs in the circuit, viz. 1 F, 2 F, 1 G, &c. point at the same signal. 1 G is an intermediate and portable telegraph, to be carried with each train, and applied, in case of need, to convenient arrangements at each mile-post or bridge along the line. The section of a railway below 1 G illustrates this subject. An iron cap to the mile-post being unlocked and taken off, the portable telegraph is placed within a ledge fitted to receive it, making thereby the necessary connexions with the conducting wires, when it is at once fit for working at the "terminal telegraphs." This form of telegraph can be worked by any person at first sight, and requires no battery to be carried with it. It is fitted up with a waterproof cover and lantern, for rainy weather and night use.

N.B. All forms of this electric telegraph are "reciprocal" in their action, *i. e.* they give the same signals, in the working as in the recipient apparatus, and work equally from either end or from intermediate points.

LIFE AND LABOURS OF TELFORD.

NO. X.

[Continued from page 405.]

Harecastle Tunnel.—Birmingham Canal. —Dean Bridge, Edinburgh.—Glasgow Old Bridge Improvement.—Gloucester Over Bridge.

Besides those two grand works of internal navigation, the Caledonian Canal at home, and the Gotha Canal abroad, Telford executed an immense number of highly-important undertakings in the same department of his profession. So numerous in fact were they, and so admirably did they in many instances display his fertility in resources, that these minor performances alone might have sufficed to build up a reputation for a Civil Engineer of considerable pretension. In the wide-spread renown of Telford they formed but auxiliary features.

The most remarkable of his efforts in this line was the new Harecastle Tunnel, on the Trent and Mersey Canal. This canal was generally considered the master-piece of the celebrated Brindley, and the tunnel he constructed through Harecastle-hill the highest triumph of his genius. By means of it he completely overcame the obstacles placed by Nature in the way of a navigable communication between the opposite sides of the northern part of the kingdom, by the high and apparently impracticable ridge, known as "the back-bone of England." Its completion formed quite an era in the annals of civil engineering, and the progress of the work was watched with eager interest by all classes. The contemporary periodicals afford abundant evidence of the great attention paid at the time to the novel and gigantic ope-

rations of Brindley generally, and in an especial degree to his proceedings at this point. From these it appears that thousands of visitors poured in from every part of the surrounding country, and even from the metropolis and other distant spots, in order to see with their own eyes the marvels which the *then* Wizard of the North was said to be effecting with the aid of no more magical implements than the mattock and the spade. Nor, until his task was actually completed, and the navigable water-way absolutely opened through the bowels of the earth, would the majority consent to give up the strongly-cherished opinion that the projected "Harecastle" tunnel would prove a mere *castle in the air*.

Since that period, the progress of the canal and railway systems has brought us all too familiarly acquainted with engineering works on an extensive scale to allow our wonder to be excited by such an undertaking. Let it not be forgotten, however, that Brindley was the first to show the way, nor let us seek to deprive him of the applause due to his daring conception and its successful execution, because the followers in his track have—aided by the improved resources which have been brought into play chiefly through the results of his exertions—in our days gone far beyond their leader. Nor let the public of the nineteenth century be too prone to smile at what may be looked upon as the too easily excited amazement of their predecessors in the eighteenth. Viewed in all its aspects, the Harecastle Tunnel must be admitted even now well worthy to have raised the admiration of those who watched its first construction, and sustained the high reputation of its most ingenious contriver.

For many years after its opening, the tunnel answered its intended purposes according to expectation, but in the course of years, in consequence of the great extension of the traffic on the line of canal to which it belonged, it proved inadequate to the increased requirements of the trade. It was made only wide enough to admit of the passage of one boat at a time, so that as at least two hours were consumed in each transit, great numbers of vessels were usually collected at each end, waiting for their turn. The delay thus occasioned became at length quite intolerable, but it was not until the resources of the Company were threatened by the proposed establishment of a rival canal, and a railway in the same direction, that the Directors bestirred themselves to seek a remedy for the evil. At last, in 1822, they applied to Telford to survey the line, and submit his suggestions for improvement; this was soon done, and his report transmitted, but it was two years later before the plans he recommended were acted upon.

The tunnel as originally constructed by Brindley, was 2888 yards in length, and nearly 200 feet downwards from the highest surface of the hill. Where its dimensions were largest, it was only 12 feet in height, and its width did not exceed 9 feet throughout. Upon full consideration, Telford came to the conclusion that all these dimensions were so much too small that it would be advisable to construct a new tunnel altogether, rather than enlarge the old one, at probably an equal or even greater expense; and this advice was finally adopted, and the new tunnel resolved upon accordingly.

One of the greatest improvements Telford had in view in recommending enlarged dimensions, was the abolition of the then barbarous method of propelling boats through the tunnel. This miserable process, denominated "legging," is unfortunately not yet extinct, in spite of the rapid march of science. In it the boatman lies upon his back, and *proh pudor!* thrusts the vessel forward by actually *kicking* all the way against the sides of the tunnel. The necessity for this Telford obviated in this case by forming a towing path along the whole extent of the excavation, 4 feet 9 inches in width, while by a happy contrivance—the supporting of the path on iron columns—he allowed free play for the flow and reflow of the water to the whole extent of the breadth of the tunnel, thus preventing the obstruction caused by the formation of waves when the boat is nearly as wide as the water-way; an object of no small importance, and which was by this means, as well here as in many other places where Telford was concerned, completely achieved.

The new tunnel was driven through Harecastle-hill in a direction parallel to its predecessor, at a distance of 26 yards, owing to which circumstance its length

is somewhat greater, amounting to 2926 yards, while its depth from the summit is less by about 18 feet. It is perfectly straight, the light being visible from one end to the other, and is in every respect vastly superior as an engineering work to the original construction of Brindley, which is still retained in operation, so as to keep the canal open both ways, and thus prevent the very possibility of detention. So completely was every object Telford proposed to himself answered by the result, that we are told the boatmen who used to look forward to the passage of the old tunnel as a sort of purgatory, are so highly delighted with the accommodations of the new one that they have been heard to say, "they only wished it reached all the way to Manchester!"

In nothing connected with the two tunnels was there a greater contrast than in the time required for executing them. That of Brindley, which was of course constructed in the comparative infancy of canal-making, occupied eleven years from its commencement to its completion, while the much larger and more commodious one of Telford was finished in considerably less than three. This one fact is sufficiently indicative of the rapid strides which practical science, especially in its application to public works, had been making in the interval.

The Birmingham Canal was another work of Brindley's which Telford was called on to improve. The line adopted was originally very circuitous, and, as the tollage was levied *at per mile*, the Canal Company saw little reason for an alteration in this respect, until competition began to be threatened. On his making a survey, Telford was surprised to find, close to the important town of Birmingham, what he defined as "a mere crooked ditch, with a towing-path hardly perceptible," to so wretched a condition had constant neglect reduced a work from the first not without defects. Seeing that half-measures here would be of no avail, Telford proposed at once a new line, which would reduce the distance to fourteen miles instead of twenty-two, leaving the bends, which by the new straight cuts would be rendered useless for navigation purposes, to become basins for the accommodation of the collieries on their banks. The summit, at Smethwick, he proposed to cut down entirely, and thus to avoid a most inconvenient amount of lockage. The canal itself he proposed to enlarge to a width of forty feet, with a towing-path on both sides, to which the bridges were to offer no obstruction, all of them being designed with a span of fifty-two feet. This bold design, though startling at first, was all carried into execution in two years only, partly in consequence of the strenuous exertions in its favour of the present Mr. James Watt, whose factory at Soho is on the banks of the canal, and who was otherwise concerned in its prosperity. In this instance also, complete success attended the alterations effected; to such an extent, indeed, that it became a common saying in Birmingham, that Mr. Telford merited a public reward on moral grounds, for introducing good manners among the boatmen, who never used to pass without quarrels and imprecations, while now they go by with mutual salutations and good-will.

Telford was engaged, during his long career, in an infinity of other canal operations, but in other instances they presented few features of more than local interest. The "Glasgow, Paisley, and Ardrossan Canal" was one of the undertakings of the comparatively early portions of his practice, and was executed, so far as circumstances allowed, with his usual excellence. It still remains incomplete, nor is it ever likely to be finished, the demand for the remaining divisions of it having in fact ceased, in consequence of the facilities which began to be afforded soon after the existing portion was completed, for steam navigation on the river Clyde. If the whole had been pushed on with that spirit which often distinguishes such operations, circumstances have since proved that the capital of the proprietary would have been thrown away. Such must often be the case in a time and country like our own, where improvement and discovery are in a state of rapid progression. The canal boats in that case would have been swallowed up by the river steamers, and these in their turn are now being swallowed up by the railway locomotive.

Telford's chief display of the resources of his art in *Bridge Building* have been already noticed, but many of his secondary efforts in that line are well worthy of attention. The Dean Bridge, at Edinburgh, over the Water of Leith, is one

of the most imposing of these. The bed of the river at the point selected occupies a deep rift in the rocks, so that the height from thence to the roadway of the bridge is no less than 106 feet. As there are four arches of this height, and each of ninety feet span, and the design, which is executed in squared sandstone, is light and elegant, the structure has a fine architectural appearance, and does great honour to its contriver, in his capacities both of architect and engineer. He introduced a considerable novelty in its construction. The main arches have their springing at 70 feet from the foundations, and at 20 feet higher; other arches, of 96 feet span, and 10 feet rise, are constructed, and the face of these projecting before the main arches and spandrils, produces a distinct external soffit of 5 feet wide, and this, with the peculiar lofty piers, form the distinguishing feature of the bridge.

The improvement effected by Telford in the old bridge at Glasgow attracted great admiration, as well for the effect produced, as by the economy of the means employed. The bridge was only 22 feet in width, footway included, when Telford was requested by the magistrates to point out some method of effecting that improvement which the increased population of the districts it connected imperatively called for. The course he adopted was simple, but effectual. Finding that the piers, though old, were perfectly sound, and that they projected beyond the parapet, he determined to procure the additional room by means of a cast-iron addition, rather than by rebuilding or enlarging the bridge itself. Accordingly, upon the pier points small pedestals were placed, of the additional width desired; from these an iron rib was thrown across the face of each arch, on both sides the bridge, from which bearers were supported, the other ends resting on the masonry cornice. These being covered with flat stones, and protected by iron railing, the whole of the old surface of the bridge was thrown open for a carriage-way, and the pedestrian public were accommodated with two separate footways, each of six feet wide. The desideratum was thus completely secured, and at a comparatively trifling cost, while the addition to the structure proved not only commodious but also ornamental; if not absolutely picturesque; the external appearance having an air of originality and lightness, through the projection of the iron-work, and the shadow cast by it on the masonry below.

In the design of the celebrated Gloucester Over-Bridge, Telford introduced a novelty in England, the idea of which was taken from the Bridge of Neuilly, over the Seine, on which rests the reputation of Perronet. The general body of the arch is an ellipse, 150 feet on the chord line, with 35 feet rise, while the *voussoirs* or external arch-stones, being in the form of a segment, have the same chord, with only 13 feet rise. This complex form converts each side of the vault into the shape of the entrance to a pipe, thus lessening the flat surface opposed to the current of the river whenever the flood rises above the springing of the middle of the ellipse. This bridge answered every expectation, and there was only one circumstance attending it which caused any uneasiness to its designer. On the centering being removed, the crown of the arch sank two inches, and in a short time afterwards eight inches more. The bridge of Neuilly sank no less than 23½ inches, but this was small consolation to Telford, when he reflected that none of the innumerable other bridges he had built ever sank at all, and that this in all probability would have held firm but for his ill-judged parsimony in venturing to leave the wing walls unsupported by piling and platforms, notwithstanding the suspicious nature of the soil at the foundations. This unfortunate economy may have been partly induced by the desire to surpass in that point Sir Robert Smirke, who had some years before erected the Westgate Bridge, at the same city, at the cost of 45,000*l.* If so, the object was certainly accomplished, as the Over Bridge cost the corporation of Gloucester less by 1,500*l.*, though of 150 feet span, while the Westgate was but 90. The triumph, however, after all was dearly earned.

One of the numerous bridges erected by Telford in Wales, was distinguished by what may be termed a literary peculiarity, which has a singular and striking effect. The iron is cast in such a manner that the spectator sees, instead of a regular pattern, under the arch, the inscription in gigantic letters:—"*This Bridge was erected in the year the battle*

of Waterloo was fought." The good taste of this escapade (for which we believe the designer was not responsible) may admit of considerable question,—the bad English of the sentence will admit of none.

THE CRANK QUESTION.

Sir,—Notwithstanding many excellent papers which have from time to time appeared in the *Mechanics' Magazine*, on the properties of the crank, many misconceptions seem still to prevail among mechanics concerning it, and in some instances a misunderstanding even as to the meaning of the conclusions brought out in the papers referred to. The exposition of this subject would require to vary and change its phrases, so as to clear up the difficulties, and meet the erroneous conceptions which are apt to arise in the minds of many with regard to it.

Most of those who have written to prove "that no power is lost by the crank," rest the whole argument on a demonstration which is sometimes rigorously made, that the momentum of the crank pin is precisely equal, at every point of its path, to the momentum of the piston in the cylinder.

Now although this, after such proof, has been by many mechanics admitted, much of what necessarily follows from it, and which is sometimes plainly deduced from it, seems not to be so clearly apprehended.

An argument, in substance such as follows, has been urged :—"If the piston has a uniform motion in the cylinder, the crank will move with an exceedingly variable velocity; but as such a movement can serve no practical purpose; and power under such a form is indeed no available power, it must be rendered uniform by some means. Now, if there were any mechanical contrivance known whereby this variable movement of the crank-pin could be turned to full account,—any piece of mechanism whereby when its velocity increased, and its tangential force diminished, their joint value for every point in its path might be transferred without loss either to some separate part, where a uniform force and a uniform velocity were sustained—then a crank engine would bring out the same amount of effective power as any other engine with a similar piston and pressure of steam that had, instead of the crank, a contrivance connected with the piston which did not involve oblique acting forces. But no such mechanism has yet been invented, or attached to a steam-engine; nevertheless, a uniform motion must be got, else the available power in question cannot be obtained. The method by which this last is usually accomplished, is by attaching a heavy fly-wheel to the crank-shaft, and while the effect of this is to equalise the motion, and in some places break down the rapid velocity, it also reduces the effective power of the engine."

Following up the same ideas, I am aware of an *experimentum crucis*, as it was supposed to be, that was made upon a model engine, with a view of determining the problem of the crank. In the first instance, a barrel was attached to the fly-wheel-shaft, round which a cord was wound and a weight attached to the same, to serve as a dynameter; the greatest weight which the engine would raise with a certain velocity was then determined. Secondly, the engine had a contrivance connected with it which did not involve oblique acting forces, and with this it was distinctly ascertained that its power was much greater, nearly double. Such a result was regarded as experimentally settling the question.

Now, as a striking oversight pervades alike this reasoning and experimental philosophizing, it may not, perhaps, be amiss to offer a few remarks, by way of placing in a more prominent light a consideration which, although laid down by several writers, seems not to have been sufficiently apprehended.

Let the engine with the crank be supposed to have its connecting rod of an indefinite length, to simplify the question; and let the radius of the barrel on the crank shaft be equal to the length of the crank. Then, when the crank is at right angles to the connecting rod, the crank-pin will be urged along with the same velocity as the piston in the cylinder, and with an equal pressure. The engine then, at this instant, would raise as great a weight by the barrel as it would do, were any other contrivance substituted for the crank that did not involve in it oblique acting forces. Suppose, however, the crank to be in some other position, near that joining the line

of centres; it will then be found that the former force when applied will not raise the same weight by the barrel, and plainly for this reason; because if it did it would raise it with a greater velocity, and the effective power of the engine would truly here be increased; but at this place the leverage has diminished—the resistance has, in consequence, increased beyond what the applied force can overcome—and motion cannot be the result. Let the weight, however, which serves as a measure of the dynamical effect, be reduced to such an extent, that if the force of the steam in the piston be more than sufficient to raise the weight while the crank is at right angles to the connecting-rod, this excess, by the help of a fly-wheel, will bring the crank along those parts of its sweep where the direct force of the steam without the aid of such momentum would be insufficient to carry it. And under these last mentioned circumstances it may be observed, that if the piston is disposed to move with an increased velocity as it passes the middle of the cylinder, (that is, when the crank is at right angles to the connecting-rod,) it will be proportionally retarded as the crank approaches the line of centres, so that the velocity with which the piston still traverses the middle of the cylinder, will be the same as it would exhibit were it connected with any contrivance, as a double rack or such like, that did not involve in it oblique acting forces.

Let us now examine the state of the crank engine. Since the weight which serves as a dynameter is here supposed to be reduced, which to suit the conditions above described would require to be about 63.6 per cent., and the space through which the said weight is raised while the piston traverses the length of the cylinder, will be equal to half the circumference of a circle whose radius is equal to the length of the crank; then, did the piston traverse the length of the cylinder in the same time as it would do if connected with a contrivance that did not involve in it oblique acting forces, the effective *power of both engines would be the same.* But since under the former mechanical arrangement the piston moves slower as it approaches either end of the cylinder, and only at the middle of the cylinder attains the velocity with which it uniformly moves throughout its whole length in the latter, the average velocity of the piston in the one is less than its velocity in the other, and the quantity of steam expended is less in the same proportion; so that the amount of power applied to the one is less than the power applied to the other; and thus the doctrine of virtual velocities appears in all its truth—the whole power that is applied being duly transmitted—the effective power being an exact equivalent to what is imparted—and consequently friction and the resistance of the air, with the imperfections of machinery, being laid out of account, the crank, like every other mechanical contrivance, will neither destroy nor generate power.

I have in these observations studiously avoided entering into any prolix demonstrations, with which this subject is not unfrequently beset, but have attempted a plain ground. Nevertheless, I apprehend that whatever is here stated may be strictly and briefly demonstrated from mechanical principles, and I shall be willing to offer such if necessary.

I am, Sir,
Yours, &c.,
A MECHANIC.

Aberdeen, April 19, 1841.

THE CRANK.

Sir,—It is almost unnecessary for me to reply to your correspondent, "R. W. T.", page 388, inasmuch as the misrepresentations he has given of my experiments, and the want of any attempt at reconciling the facts given in that experiment with the doctrine of virtual velocity, must be obvious to any person who may read my paper in the most cursory manner.

I did not contend that when a lesser power held a greater in equilibrio and that no motion ensues, that there must be loss of power—nothing could be farther from my meaning.

"When motion takes place," he says, "we see how the matter stands," the doctrine of virtual velocity shows us that there is no loss of force whatever when the system is in motion, and therefore there could have been none when at rest, but in the case of my experiment the system is in motion, and it is by motion alone that the fact is established that these experiments are not reconcilable with his doctrine. When the half of 56 pounds was carried double the distance

in the experiment, the same work was done with the same expenditure of power, and I expressly stated that it might be expected such would be the case, though I had every right to conclude that the weight of 37½ lbs. should be moved over a space of 6 inches, under the peculiar circumstances in the experiment detailed, so as to have the same amount of work done with the same expenditure as in the former case. And I contend that when it did not move over that space, the result of the experiment is directly at variance with the doctrine of virtual velocity. It was my intention, by the experiment, to prove this to be the case, and your correspondent has in his own peculiar way admitted the fact. Had I drawn the weight back 22 inches, as he states, the calculation would stand thus :— 56×22 inches $+ 28 \times 4 = 1344 = 51\frac{1}{3} \times 26$ inches; so that instead of the weight of 50 lbs. having to draw 37 lbs. 6 inches, it would have to draw 51⅓ lbs. a space of 26 inches. If it would not draw the lighter weight the short distance, I do not think it would do the greater distance with the heavy weight, and I have no doubt the result would be more in my favour. The 50 lbs. weight was made barely sufficient to move the weight of 56 lbs., as the object in view was that it should come against the stop with the smallest accelerated velocity possible. Your correspondent therefore does not get out of the dilemma by altering the admeasurements, any more than he does by contending that there must be some ambiguity in the meaning of the word, loss of power, so as to make these experiments square with his favorite doctrine; I little thought this latter mode would be adopted, and that refuge would be taken under the more plausible word, friction, or that it would be said, mathematicians had all along in the discussion made a special exception to this troublesome element; but I am glad to find that although I was not fortunate enough to make other parts of my paper clear to your correspondent, I was very successful in doing so in that particular. The want of parallelism in the lines was almost an objectionable matter, but he forgets that such objection was as much in his favour as mine, as all the lines were in the same position drawing the 28 lbs. as they were when drawing the 37. I purposed when I commenced this paper to make it somewhat more interesting than in replying to such objections as have been made to my experiments, by proving mechanically extra loss of power in the crank than what I have already done, but I must postpone this to another day as I have already extended this article to too great a length.

I am, Sir, &c.,

M.

McCRIRICK'S IMPROVED PERCUSSION GUN-LOCK.

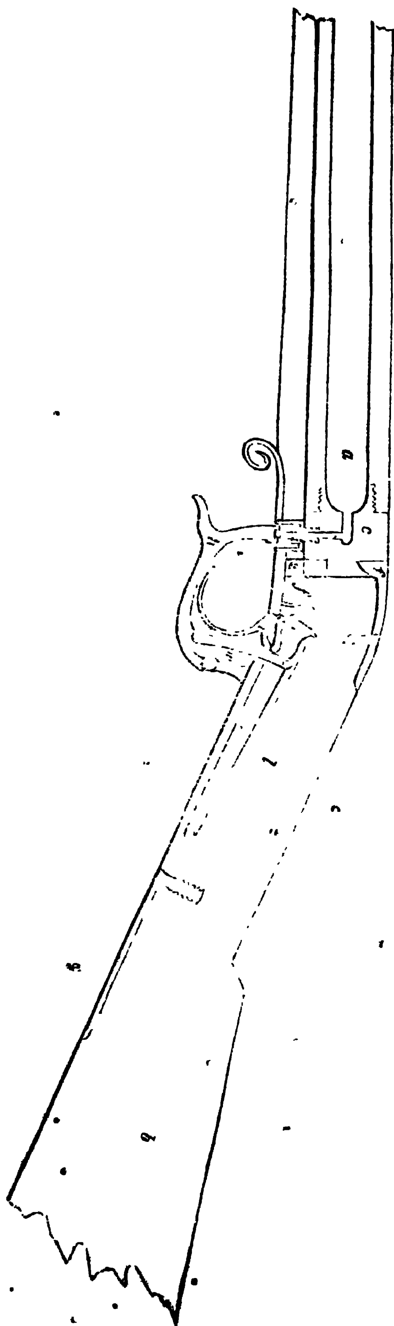
The established superiority of percussion locks for the rapid and certain discharge of fire-arms, having led to their adoption by some portion of the British and Continental armies, much attention has been given to this contrivance with a view to its being rendered more perfect against some of the contingencies to which it has been liable. While foreigners are vaunting the merit of sundry improvements in percussion locks, and the Russian musket is by some held to be the *ne plus ultra* of modern improvements in this line, we are induced to publish the following description of an ingenious percussion lock which was invented by Mr. McCririck in 1827, and was submitted, together with the Archimedean Screw Propeller, to the miscalled Society for the *encouragement* of Arts, &c., in the year 1830, who pronounced both inventions to be "not entitled to their reward!"

By reference to the Society's Transactions for that period, our readers will be enabled to form some idea of the Society's discrimination, and of their capacity to appreciate real merit. The practical and comparatively successful application of the *Screw Propeller* is now a matter of notoriety, and this contrivance was not submitted to the Society of Arts until Mr. McCririck had by numerous and long-continued experiments fully established its probable usefulness. His other invention, the Percussion Lock seems calculated to range with the best contrivances of the present day.

The following explanation is extracted from Mr. McCririck's communication to the Society of Arts, dated "Irvine, December 10, 1830."

"*Description of the improved Gun Lock.*

"The gun lock, the drawing of which you have now in your possession, was the result



of a suggestion made to me by a gentleman fom North America, who explained to me the great necessity there was for such a thing in that country, at the same time advising me to turn my attention to the subject, and try, if possible, to invent something to answer the purpose, to preserve the lock from wet on their shooting excursions through the woods, to which the present plan of gun lock was very liable. In this, as may appear to your Honourable Society I have so far succeeded, one of which guns I finished and sold to the gentleman, and with which he was highly pleased.

"The advantages of this gun over the common copper cap gun are, that no falling water can possibly effect the lock or cap while the gun is carried in any ordinary position.

"That the face and eyes are perfectly safe from any danger by the cap flying.

"That this gun must fire quickly and be less liable to snap than the common gun, there being no winding in the passage betwixt the caps and chamber of the breech.

"That this lock can be applied to the common breeched gun with greater propriety and safety than any plan hitherto invented, as the shoulder of the nipple rests entirely upon the solid bottom of the flash guard, and prevents the screwing for the nipple and barrel from being injured by the stroke of the cock.

"Likewise the novelty, simplicity, and durability of the gun, the old lock being entirely laid aside, leaving nothing but the appearance of the common guard.

"When using this gun charge the barrel in the ordinary way, then putting on the cap lift the gun to that position, in military term called present, only be sure to keep the side of the gun to the breast, place the fore finger of the left hand upon the horn of the cock, resting the thumb upon the joint, lift the cock until the trigger catch, then put on the cap and let the cock softly down upon it again.

"When going to fire lift the gun and bend the cock in the same manner as directed above for putting on the cap, shifting the hand at the same time to the general position for firing.

"I humbly beg leave farther to observe, that from the simplicity of this lock, and its easy application to the common breeched gun it might be applied to the common musket with advantage, as the mode of using it falls much into the military form."

Description of the Engraving.

a, the bore of the gun; *b*, the stock or butt; *c*, chamber in the breech; *d*, nipple; *e*, communication with chamber of gun; *f*, false breech; *g*, a nail which passes through the stock and joins the

lock-plate and false breech together; *h*, the cock in fired position; *i*, trigger; *k*, spring which keeps the trigger in position when on cock; *l*, main spring; *m*, bridle connecting main spring with cock. The cock is raised until the main spring slips into the check shown in the trigger and is let go by overcoming the resistance of the spring at the back of the trigger, &c.

MR. ADCOCK'S PATENT SPRAY PUMP.

[Abridged from a Report in the *Liverpool Courier* of a communication made by Mr. Adcock to the Liverpool Polytechnic Society.]

(*Concluded from page 427.*)

"I then proceeded to investigate the greatest descending velocities of drops of rain, and I found that, under ordinary circumstances, they were from 8 to 12 feet in a second; from which time, the remaining portion of the reasoning was clear and decisive; namely, if water in globules, of a certain size and weight, like drops of rain, cannot, under ordinary circumstances, and in consequence of the resistance which they met with in the air, descend with a greater speed than 12 feet in a second, then, it is certain that if these drops were in a quiescent state, and a current of air were made to move *upwards*, at a greater speed than 12 feet in a second, these drops would flow upwards instead of downwards, *and that too, whatever the height.* Hence, the invention was perfected. I had only to try the experiment in secret. It far surpassed all that I had expected from it, and I forthwith secured the patents. But other effects have resulted in practice, which I never calculated upon nor expected. I have had an apparatus made, on the patent principle, to raise, agreeably to an order which I had received, 10 gallons of water in a minute, 42 feet in height. It was erected at the works of Messrs. Milne, Travis, and Milne, at Shaw, near Manchester. The fan, which gave motion to the air, was only 3 feet diameter, and 1 foot wide, and it made about 900 revolutions in a minute. Instead of raising 40 gallons 42 feet in height, it raised at the rate of 130 gallons of water in a minute, 120 feet in height.

This effect, so much greater than it ought to have been for the power expended, caused me, for some time, much anxiety of mind. It seems to have arisen from a law of nature which is but little known or understood by practical men. I cannot, however, enter upon details here. It is sufficient for me to state in this place, that the natural tendency of the current of air upwards, from the fan at Shaw was 116 feet in a second; a speed, I believe, hitherto never obtained, or conceived to be possible, in the raising of weights."

Mr. Adcock then continued—

"By the present mode of raising water from mines and other deep places, by pumps and pump-rods, and other mechanical contrivances, the water is raised through a series of pipes, in a compact or solid state; in other words, if the depth through which the water must be raised, by one pump or one lift, be 100 feet, then the pipes, extending to that depth, will be full of water, and the whole column of water in those pipes will be lifted at one and the same time.

"A column of water 100 feet deep, presses with a force of about 45 pounds on each square inch of its base.

"Hence, if the diameter of the pump-bucket, or plunger, be 12 inches, and its area, as a consequence, 113 inches, the weight of water to be lifted, *at each stroke*, will be about 5,085 pounds.

"In a deep mine, therefore, containing 10 such columns or lifts of water, below one another, and acted on at the same time, by the same pump-rod, extending down the shaft or pit of the mine, the weight of water to be raised will be very great, being not less than 50,850 pounds, or about 23 tons.

"Hence, to lift such weight of water, and to overcome the friction of the water in the pipes, together with the *vis inertiæ* to put such columns of water in motion, and to support its own weight, the pump-rod must be made of great strength; and the steam-engine, water-wheel, or other prime power, by which the effect must be produced, must be of large size and great power.

"By consequence of that *vis inertiæ*, the friction, and the great weight to be put in motion—and when steam-engines are employed, the alternate action or reciprocation of the great lever or beam of the engine—the number of feet of *effective* strokes, made, per minute, is comparatively small, being generally in deep mines, from about 50 to 80 feet. To explain this more fully, the whole mass of water in the ten columns, having to be raised at one and the same time, and therefore being equal in weight to one column of water of the same diameter and 1,000 feet in depth, may be considered as being lifted in the mass, through a distance of 50, or from that to 80 feet in a minute. Whereas, by my '*Improvements in raising water from mines and other deep places, or from a lower level to a higher, which improvements are applicable to the raising of liquids generally, and to other purposes.*' I do not raise water or other liquids in the mass, nor do I find it necessary to exert a pressure, at one and the same time, of 45 pounds on each square inch, when the height to which the water must be raised is 100 feet; nor do I raise water by pumps and pump-rods; but in the manner now to be described.

"That is to say, by the aid of a steam-

engine, water-wheel or other prime mover, I give motion to a fan, or fanner, (such as is used very commonly by foundry-men, engineers, mill-wrights, and others, to force a current of air into cupolas and other kinds of furnaces,) or to the piston of a blowing cylinder, (such as is used by iron-masters and makers of iron, to force a current of air into blast furnaces, for the reduction of ores,) and, by aid of such fan or fanner, or blowing cylinder, I condense atmospheric air, that it may, when liberated from its confinement, have a tendency to escape into the atmosphere, with a velocity due to its pressure.

"When atmospheric air is condensed to a quarter of a pound pressure per square inch beyond the atmospheric pressure, and is liberated from its confinement, it moves, or has a tendency so to do, at the rate of 173 feet in each second of time; at half a pound pressure per square inch, the speed due to the pressure, is 245 feet per second; at three-quarters of a pound pressure, 296 feet; at one pound, 340 feet; at a pound, and a quarter, 375 feet; at a pound and a half, 410 feet; at a pound and three-quarters, 436 feet; at two pounds. 467 feet; at three pounds, 555 feet; at four pounds, 624 feet; and at other pressures, with other velocities or rates of speed, as may be known by reference to, or consulting the Treatises that have been published on the science of Pneumatics.

"Now, instead of raising water in the mass, as herein-before described, by pumps and pump-rods, and such like contrivances, I avail myself of the mechanical effects that may be obtained from the velocities of the air, as due to the pressures herein-before made known, or any other pressures that circumstances connected with mines, in different localities, may prove to be desirable.

"I cause the water that must be raised from the mine, or from a lower level to a higher, to be dispersed and carried up in drops, like drops of rain; but the velocity of those drops, *upwards*, in consequence of the velocity of the air, is far greater than the *descending* velocities of rain.

"For drops of rain, when not receiving an impulse from winds, can only descend through the atmosphere with a speed of about 8 feet in a second, when the diameter of each sphere or drop of rain is the hundredth part of an inch. When the diameter of the drop is the sixteenth part of an inch, the greatest descending velocity through the atmosphere is about 17 feet in a second; and the velocities in a second, through the atmosphere, for drops of rain of other diameters, may be thus stated: for drops of rain an eighth of an inch diameter, 24 feet; for drops three-sixteenths of an inch diameter, 30 feet; and for drops a quarter of an inch diameter, 34 feet per second. Whereas, the velocity of the air, when allowed to escape from a pipe upwards at one pound pressure per square inch beyond the atmosphere, and without making any deductions for the friction against the sides of the pipes, is about 340 feet in a second. But it should be stated that, when the air is commingled with the water that must be carried up by it from a mine, or from a lower level to a higher, its motion, to a certain extent, is retarded. The velocity of the drops of water *upwards*, however, by this mode, or by these modes of raising water from mines and other deep places, is far greater than the velocities at which rain usually descends, as hereinbefore has been described."

We cannot pursue Mr. Adcock's pamphlet any further. All that we can now state is, that Mr. Adcock's invention has been put down, *practically*, at the Pemberton Pit, Wigan, which is under the management of Mr. Robert Daglish. The pit is 100 yards deep, and Mr. Adcock proposes to bring up from that depth from 240 to 300 gallons per minute; and, from a preliminary trial already made, there appears to be no doubt as to the success of the invention.

ROTARY ENGINES—THEORY AND PRACTICE.

Sir,—In the letter which you did me the honour to insert in your 929th number, the change of a word will render the meaning of one sentence more plain. At page 405, line 5 from the top, for "inner circumference of the last," read, "inner circumference of the case."

Craig's rotary engines, I am informed, still continue to "progress" in public estimation, and several have been erected subsequently to the date of your notice of it. Measures are now taking to ascertain, upon the Great Western Railway, its applicability to locomotives. Can you, or any of your correspondents give any information respecting Messrs. Corde and Locke's engine. Has it yet been tried upon a large scale? and with what success?

I remain, Sir, yours respectfully,

O. Y.

Hammersmith, May 31, 1841.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

JOHN HAUGHTON, M.A., OF LIVERPOOL, CLERK, *for improvements in the means employed for preventing railway accidents resulting from one train overtaking another* Enrolment Office, May 24, 1841.

A number of clocks are placed at inter-

vals of two miles on both sides of the railway, throughout the line; they are mounted on hollow iron posts, and their faces are inclined to the line in order to favour their being seen by the drivers of approaching trains. At each of the clock stations a bar is laid along just within the rails, which is connected by cranks and levers with the clock motion. On a train approaching one of the clocks, the flanges of the wheels press down this bar, which disconnects the hands of the clock from the wheel work, and the hands being acted upon by weights assume a vertical position and point to 12 o'clock. When the train releases the bar, the hands are reconnected with the works and the hands move round the dial in the ordinary way. By this means the driver of the succeeding train sees how long it is since a train preceded him, by noticing how much it is past 12 o'clock, and is thereby enabled to judge of its probable distance or proximity. The passage of his own train then restores the hands again to the original starting point of 12 o'clock, in order to communicate similar information to the next arriving train. At intervals of a quarter of a mile beyond each clock a reservoir of condensed air is placed, furnished with a valve connected with a similar bar to the foregoing; on a train depressing this bar the valve is opened and the condensed air passes into two pipes branching off to the two nearest clocks—one behind, the other in advance of the train; the air from these pipes enters two cylinders and forces up pistons, one of which covers the lower part of the face of the nearest clock with a round black disc, the other obscuring the farthest clock with a square disc. The air pipe is continued a quarter of a mile beyond the farthest clock, where the approach of the train opens another valve which allows the air to escape and the discs to fall. Thus if a driver finds no discs before the dial face, he knows that the line is clear for at least 2¼ miles; but if he sees a round black disc on the lower part of the dial face he knows the train has passed a quarter of a mile ahead of him, but has not yet reached the escape valve 2¼ miles in advance, and so on.

In order to register the times of passing trains, a cylinder is placed in each clock case, carrying a paper divided into twelve parts by lines parallel with its axis; this cylinder is moved round by the clock once in 12 hours, at the same time moving horizontally by a screw thread on its axis. The 12 parts which represent hours, are subdivided into half-hours, quarters, and minutes. Every time a train passes, and the clock hands are acted upon, a pointed instrument makes an indent in the paper cylinder which shows the time at which such train passed.

The claim is, 1. To the mode of employing a time-keeper, suitably acted on by each passing train, to indicate the length of time which has expired between the passing of one train and the coming up of another: also, combined therewith, the using of apparatus to indicate whether the preceding train has passed certain distant points; and further, the combining therewith, apparatus to register the time of each train passing.

2. To the mode of working discs, or other similar instruments, as signals or indicators on railways, by condensed air, as above described.

3. To the mode of registering the times of passing trains on railways, whether in combination with time-keepers used for the purposes above described, or otherwise.

Henry Walker Wood, of Chester-square, Gentleman, *for an improvement in producing an uneven surface in wood and other substances.* Petty Bag Office, May 25, 1841.

A die or mould of the design is framed in metal, which, being made red-hot is pressed down upon the wood or other substance, by which means the required portions will be burnt away, leaving those which are to form the pattern. On being removed from the press, the article is thrown into water, and the burnt parts removed by brushing or scraping.

The claim is to the new combination of means, or mode of producing an uneven surface, object, or figure, upon wood or other combustible substance, by repeated contact with hot moulds or dies, operating against the wood or other combustible substance, in the manner described.

Junius Smith, of Fen-court, Fenchurch-street, Gentleman, *for certain improvements in furnaces.* Enrolment Office, May 25, 1841.

These improvements consist in supplying heated air to furnaces by a peculiarly formed revolving fan or blower, mounted in a double box or case, and made with arms carrying variously formed fans. The blower draws in the air at its centre and forces it into a closed ash-pit, where the air becomes heated by mixing with the unconsumed combustible gases, which are not permitted to escape up the chimney in the ordinary way, but are retained in a receptacle between the usual point of exit and the top or back of the blower, by which they are received and returned into the closed ash-pit as before stated. The combustion of the fuel and returned gases is supported by the fresh air taken in at the centre of the blowers. The incombustible gas descends by its gravity into a receptacle in the outer box, beneath the blower, from whence it is forced through a bed of sand or gravel into a chamber below, from which it escapes by a pipe.

Thomas Barratt, of Somerset, Paper Manufacturer, *for improvements in the*

manufacture of paper. Enrolment Office, May 25, 1841.

These improvements are twofold, consisting in the first place in the application of currents of air to assist the operation of the steam drying cylinders. Above and below the ordinary steam cylinders, a pipe is placed having a row of perforations, through which a stream of air rushes, passing over the surface of the paper as it winds round the steam cylinders in the state of engine-size, or water-leaf.

Secondly, The sheet of paper after leaving the sizing apparatus passes over an open reel, having within it a revolving fan, which fans and dries the paper as it passes round the reel; the paper afterwards passes over the drying cylinders, and through the glazing rollers, being subjected to the stream of air as before described.

The claim is 1, To the mode of drying paper, by applying streams of air to the surfaces as the paper is being dried by steam cylinders, whether in the state of engine-size, or water-leaf, or after sizing.

2, To the application of currents of air to the surface of the paper after sizing, in order to cool the size, as the paper passes to the steam drying cylinders.

ROBERT ROBERTS, OF BRADFORD, LANCASHIRE, BLACKSMITH, *for a new method or process of case-hardening iron.* Petty Bag Office, May 25, 1841.

This method consists in heating the iron and plunging it into cast iron in a state of fusion and turning it about, when it will become cased to any required thickness from $\frac{1}{16}$ to $\frac{1}{2}$ an inch, when it is to be plunged into cold water, and will then be found to be effectually case hardened.

The claim is to the method or process of case-hardening iron, by coating, covering, or combining wrought iron with cast iron.

HENRY CHARLES DAUBENY, ESQ., BOULOGNE-SUR-MER, FRANCE, *for a certain invention or improvement in the making and forming of paddle-wheels, for the use of vessels propelled in the water by steam or other power, and applicable to propel vessels and mills.* Enrolment Office, May 25, 1841.

The floats are mounted on spindles or axes, one end of which work in a box or centre, the others in the circumference of the paddle-wheel. Near the ends of the spindles which work in the box, there are short levers which work against a traverse, so as to expose their broad surface to the water, while they enter and quit it edgeways. By this feathering operation, all the inconveniences arising from back water are obviated.

In order to relieve the paddles from the effects of heavy seas, they are provided with an escapement consisting of two or more cogs let into the box of the wheel, and traversing round with it in a groove provided for that purpose in the flanch or carrier, fixed on the end of the main shaft; in this groove there are bridges which cause the cogs in passing them to throw up their front ends, and thus present their hind ends opposite to abutments formed in the face of the carrier, which, coming in contact with the hinder ends of the cogs turn the paddle-wheel round. In the event of this wheel being struck by a heavy sea, the blow causes it to revolve faster than the carrier, and thereby relieves it from the injurious effects of the concussion. When the force of the sea is expended, the abutments again come in contact with the cogs, and the wheel is driven round by the effects of the engine.

A mode of placing paddle-wheels in an inclined position is shown, by which means external projecting paddle-boxes are dispensed with.

CHARLES GRELLETT, OF HATTON GARDEN, MERCHANT, *for new modes of treating potatoes, in order to their being converted into various articles of food; and new apparatus for drying, applicable to that and other purposes.* (A communication.) Enrolment Office, May 25, 1841.

This invention consists in the adaptation of potatoes to the making of bread, biscuits, pastry, &c.

A paste of potatoes is prepared in one of the four following ways:—

The skins of the potatoes being removed by a suitably constructed grating machine, the potatoes are boiled and then reduced to a paste. The potatoes are skinned, boiled, dried, and reduced to the state of flour. The pulp of potatoes deprived of the feculent parts is made into a moist paste. Or, the potatoe pulp is boiled, dried, and reduced to the state of meal.

The apparatus for drying consists of a chamber into which hot air is passed, having been previously passed over lime, to abstract all possible moisture; this hot dry air is admitted into the drying chamber by sliding-valves, and when charged with moisture is drawn off by a revolving fan.

The mill for grinding the preparation of potatoes consists of two vertical stones, whence the meal or flour passes to a bolting cloth, through which the finest particles fall, the larger being raised by a screw and reground. The fine particles pass through hollow metal columns into a suitable vessel, from which they are moved by an endless screw, turning in a double cylinder, into a box. This double cylinder is of zinc, the internal space being filled with flannel saturated continually with cold water, so as to cool the flour in its passage. From this box the flour is raised, by cups placed on an endless band, into the drying chamber.

JAMES ROBINSON, OF THE OLD JEWRY, MANUFACTURER, *for a sugar-cane mill of a*

new construction, and certain improvements applicable to sugar-cane mills generally, and certain improvements in apparatus for making sugar. Enrolment Office, June 2, 1841.

The patentee states, that it is only customary to submit the sugar-canes to two pressures, *i. e.*, to two pairs of rollers, which are insufficient to express the whole of the juice. His first improvement, therefore, consists in applying three pressures, either by one large roller acting against three smaller ones, or by three pairs of rollers. His second improvement consists in the introduction of a pipe, with a row of perforated holes, between one set of the rollers, from which jets of hot water or of steam issue against the canes, and facilitate the expression of the juice. In order to feed the sugar-canes to the rollers, an endless band is employed, running on two rollers, one of which is furnished with a crank, suitably connected with the throttle-valve of the steam-engine, so that whenever an over-feeding of the rollers takes place, or if the feeding ceases, the steam is shut off and the machinery stopped.

In order to guard still further against the ill effects of any irregularity in the working of sugar mills, a driving wheel is constructed in the following manner:—A groove is turned in the periphery of the wheel, in which friction brasses are introduced, a toothed ring has a similar groove on its interior surface, into which the friction brasses are forced by set screws, which are so regulated as to hold the toothed ring to its work so long as it continues uniform, but if any obstruction occurs, the friction of the brasses is overcome and the wheel slips round without turning the toothed ring on its circumference.

In lieu of casting the rollers of sugar mills and mounting them on detached axles, the patentee proposes to cast the rollers and axles in one piece, leaving them hollow for the reception of steam. In order to supersede the addition of leaden or other separate rims to sugar pans, each pan has a portion of an elevated rim cast with it, the parts between each pan being rather lower than the sides; so that when the series are put together the boiling over of one pan will be caught by the next, &c. A mode of setting flat sugar pans is shown: one part of each of which is protected from the effects of the fire by a shield of bricks, and is therefore in a quiescent state, and serves to collect the whole of the scum from the boiling mass.

Finally, to avoid the injurious effects of iron surfaces on sugar, the patentee proposes to make sugar pans of tinned iron plate, or to make them of cast iron, and afterwards to tin them.

The claim is—1, To the mode of constructing sugar-cane mills, whereby, the sugar-cane in passing shall be pressed at least three times, and the rollers tied with malleable iron straps.

2, To the application of hot-water or steam to sugar-canes as they are passing through sugar-cane mills.

3, To the means of feeding sugar-canes into sugar mills of any construction.

4, To the mode of constructing the driving wheels of sugar-cane mills.

5, To the mode of casting rollers of sugar-cane mills with necks or axes as described.

6, To the mode of forming a rim round a set or series of sugar-pans, by casting part of such rim on each pan as described.

7, To the mode of setting sugar-pans with flat bottoms.

8, To the application of iron pans tinned, or coated with tin, or alloys thereof.

Henry Bridge Cowell, of Lower-street, Islington, Ironmonger, *for improvements in taps to be used for or in the manner of stop-cocks, for the purpose of drawing off and stopping the flow of fluids.* Rolls Chapel Office, June 2, 1841.

This tap consists of a horizontal tube or passage terminating in a head, within which the passage turns downward, and is closed by a moveable valve or stopper raised or lowered by means of a screw handle; the stopper is suspended at the lower end of two upright connecting links, one on each side of the spout; which links pass down through two holes in the metal head of the tap. The upper ends of these links are attached to a collar fitted round the neck of a screw, so that the screw will turn freely in the collar, lifting or depressing it according to the direction in which it is turned. The screw may terminate in a thumb piece, or in a spindle for the reception of a key forming a lock cock.

This form of tap is shown as applied to the purposes of ball-cocks, and is equipped with Mr. Baddely's contrivance for keeping the cock fully open till the cistern is filled, as described in our 405th number, vol. xv, page 162. A second form of tap is shown in which the fluid rises up an annular passage in the head of the cock and then descending escapes at the lower orifice; the annular passage being closed by a valve or stopper pressed down upon it by a screw.

The claim is, 1. To applying the screw, by force whereof the stopper is to be closed, or drawn into its place in the manner hereinbefore described, whereby the said screw is situated wholly at the outside of the passage, by which the fluid is to flow through the cock or tap, so that the screw (having no communication with that passage) cannot cause any leakage of the fluid. Also, the force of the screw is transmitted to the stopper by means of two connecting links extending from opposite sides of the stopper

to a collar fitted on the neck of the screw; and the action of the screw so applied and transmitted closes the said stopper, by moving the same in a direction contrary to the flow of the fluid through the tap or cock, so as to bring the said stopper into close contact with the margin around an orifice of the passage, in order to stop that passage, without having any moving part within that portion of the passage through the tap or cock to which the fluid can have access, before it arrives at the said orifice, which is so closed. Also the said position of the passage through the body and head of the cock or tap being formed of one piece of metal without any junction to which the fluid can have any access, before it arrives at the said orifice which is so closed. Also the stopper, having a movable facing piece which can be renewed when required.

And secondly, as regards the tap or ball-cock, in applying to such a cock a second ball, and also (in connection therewith) a click or detent to catch into suitable notches in such manner as to prevent the passage for the fluid through the cock from being closed (by a gradual action of the ordinary ball) until the cistern is quite full, and then the said second ball operates to release the said click or detent, in order to allow the passage to be closed all at once, by a sudden action of the ordinary ball.

Thirdly, in applying the stopper so as (by force of a screw) to close an annular orifice of the passage through the tap or cock; the said screw operating by moving the stopper in a direction contrary to the flow of the fluid through the said annular orifice, so as to bring the said stopper into close contact with the two circular margins around such annular orifice, in order to close the passage.

ALEXANDER HORATIO SIMPSON, OF NEW PALACE YARD, WESTMINSTER, GENTLEMAN, *for an improved machine or apparatus for working pumps.* (A communication.) Enrolment Office, June 7, 1841.

The apparatus in this case employed, consists of a heavy weight affixed to a pendulum-rod, on which it can be adjusted by sliding it up or down; on the axis of the pendulum is a cross-head, from which connecting rods descend to the pump levers. The motion of the vessel causes the pendulum in its efforts to sustain its perpendicularity to work the pumps.

In another arrangement, the weight is suspended nearer to the axis, the rod being continued upwards and furnished with vanes and apparatus for changing their positions, so that the alternate action of the wind causes the vibration of the pendulous weight, producing the required action in the pumps.

The claim is, to the improved apparatus or machinery whereby the working of pumps is caused by the power of a pendulum preserving its perpendicular position in one case, while the vessel to which it is attached is in motion, seeking to regain its perpendicular position; in the other, when acted upon by the wind, the body to which it is attached being stationary.

The resuscitation of this obsolete contrivance cannot possibly be of any advantage; a staler scheme was scarcely ever patented.

JOSEPH HALEY, OF MANCHESTER, ENGINEER, *for an improved lifting jack for raising or removing heavy bodies, which is also applicable to the packing or compressing of woods or other substances.* Enrolment Office, June 9, 1841.

Within the stock of this jack there is a worm wheel or nut fitting the screw, and bearing on a strong iron support; an endless screw or worm on the axis of the handle takes into this worm wheel and causes the projection or recession of the screw. Where less power and a quicker motion are required, the nut carries a set of bevilled teeth, which take into a bevilled pinion on the handle shaft.

The lower part of the screw is formed into a claw or foot, which projects through a slot in the jack, by which it is kept parallel; so that the force of the jack may be applied either at the top, or from the bottom of the screw.

The claim is—1, To the general construction and arrangement of parts as set forth and described.

2, To the forging and constructing the claw as a solid part of the screw, and guiding the same on the external surface of the jack, by which the main screw is kept in an accurate perpendicular position when in action.

3, To the placing an internal screw-wheel inside of the stock, by which it is kept clean and protected from injury.

THOMAS HARRIS, OF SHIFFNAL, SALOP, VETERINARY SURGEON, *for an improved horse shoe.* Enrolment Office, June 9, 1841.

This is an expanding horse shoe; it is made in three pieces, viz.: the toe piece and two sides connected by conical rivets forming a joint, which admits of lateral expansion of the sides, within proper limits.

Expanding horse shoes have been made before, but they have been jointed in the front or toe piece; this patentee very justly observes, that the front of the hoof is much thicker and stronger than the sides where expansion alone takes place, and for which he has made due provision in the foregoing contrivance.

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BOTTEN'S IMROVED GAS-METER.

Fig. 1.

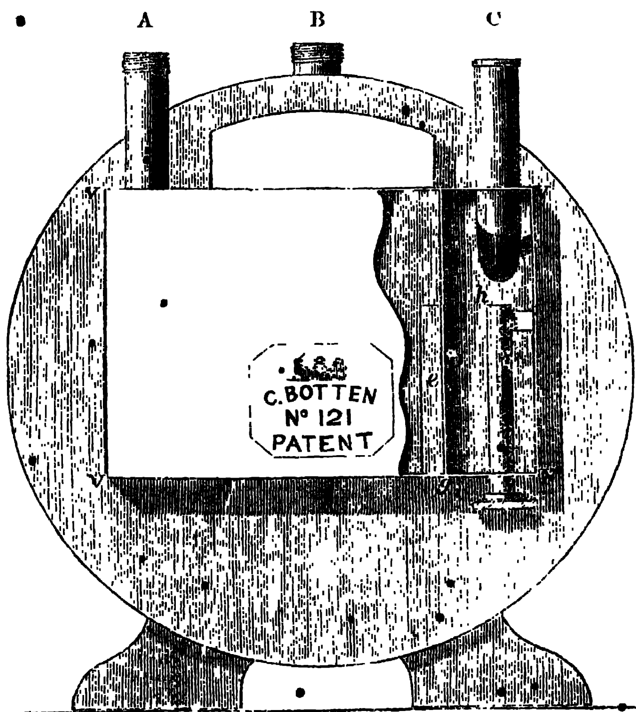
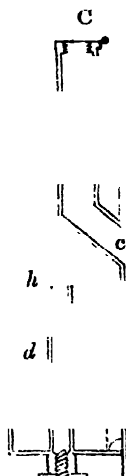


Fig. 2.



BOTTEN'S IMPROVED GAS-METER.

Amongst the numerous improvements that have been made in the apparatus connected with the manufacture and distribution of gas, the gas-meter holds an important place. It is now just two-and-twenty years since the Society of Arts awarded Mr. Malam their Gold Isis Medal for his invention of the first practical gas-meter; and the value of his invention may be inferred from the fact, that *all* the gas-meters in use at the present day are precisely the same in principle and nearly similar in construction.

Perhaps the principal difficulty, is one which seems to have occupied much attention, namely, the maintenance of the correct water level; and this is a matter of the utmost importance, inasmuch, as upon it, the accurate performance of the instrument as a gas measurer almost entirely depends.

Among the specifications of patents enrolled during the present week, there is one by Mr. Charles Botten, Gas-engineer of Farringdon-street, "for a certain improvement in gas-meters,"* in which, by a singularly happy contrivance, the preservation of the water level is most effectually provided for. The view which the patentee takes of this subject, and the nature of the remedy which he has provided, will be understood fully from the following extract from his specification:—

"Whereas it is requisite, in order that gas-meters should register correctly the quantity of gas which passes through them, that the water in them should be maintained at a certain fixed level, but that, according to the mode in which they are now ordinarily constructed, the height of the water line is constantly liable to variation, sometimes from the removal or imperfect action of the float, which should close upon the gas inlet valve when the water falls below its proper level, in which case the quantity of gas registered is too little; and sometimes from the introduction of an excess of water, in which case the quantity of gas registered is greater than that which actually passes through, in proportion to the excess of water introduced. The present invention consists in constructing gas-meters with such additions, that the water may always be kept with perfect certainty at its proper level; (loss from evaporation always excepted,) and that should any excess of water be introduced, such excess will overflow into a waste or discharge pipe provided for the purpose, without affecting in the least the said level."

Fig. 1 (see front page) is a front view of a gas-meter with part of the front plate removed, in order to show the improvement, and fig. 2, is a cross section of the same. A is the gas inlet pipe, and B the outlet pipe, both situated as usual; C, is a pipe for the introduction of the water; D, is a close chamber, soldered tight, and having no communication with the rest of the meter, except through the small orifice *g* at the bottom thereof. The water pipe C is passed a short way down this close chamber D, and being then curved backwards, opens into a broad flat passage *c d*, behind, which leads into the interior of the meter. Outside of the close chamber D, and within the square frame *v v v v*, there is a vertical pipe *e*, which is open at top and terminates at bottom in the before-mentioned orifice *g*. The height of this pipe *e* is exactly the height at which the water should stand in the meter, in order that it may register correctly the quantity of gas which passes through it. Now it will be at once perceived, that as water is supplied through the pipe C, it will enter the body of the meter at *d*, whence it will pass through an opening in the centre of the meter into the square frame, and will rise to the top of the pipe *e*, down which it will flow and enter the close chamber D, through the orifice *g*. As the water is added, it will rise within D to the top of the waste pipe *h*, fixed in the chamber D, which is of the same altitude as the pipe *e*, and also open at top, so that on the least excess of water being introduced, it overflows and escapes down the pipe *h*.

In the prefixed engravings the pipe *h* is represented as being closed at bottom by a screw plug, the head of which projects through the close chamber D: but the apparatus will work equally well if it is left open.

From this mode of construction it follows, that when the water level has been once accurately adjusted, that is, so as to be in a line with the top of the pipes *e* and *h*, it will always maintain that level; (loss from evaporation

* Enrolment Office, June 16, 1841.

excepted) and that, supposing the bottom of the waste pipe *h* to be closed by a screw plug as represented, or that it should be otherwise stopped up, and that a greater excess of water should be introduced than that pipe will hold—by opening the screw plug at any time, the addition of the surplus water will be at once detected, and *the water at the same instant restored to its proper level throughout the meter.*

THE CRANK.

Sir,—The subject of the crank movement as connected with a supposed loss of power, appears to me to lie in a nutshell, and it certainly never would have perplexed the minds of good common sense mechanicians, if they had not been bewildered by the lop-sided and short-sighted investigations of the mathematicians. The difficulty may be solved in a moment, by merely making a distinction between "loss of power" and "loss of effect," and by defining the term "loss," whether it shall mean *waste*, or simply *deficiency*, for as it may imply either, or both, there is great ambiguity in its general unguarded acceptation.

So far as the crank movement creates friction, there is a loss (or waste) of effect, and consequently, a loss (or waste) of power. Whether the loss in this respect is greater than in other arrangements for producing rotary motion is another question, and not for present discussion. Again, inasmuch as the crank movement is one of continually varying leverage, there is confessedly—in comparison with an arrangement in which the force is ever acting at a tangent to the rotary motion, that is to say, in which it is always operating at a right angle to the lever of rotation—a considerable loss (or deficiency) of effect, and there is necessarily a corresponding loss (or deficiency) of power. In other words, from a given cylinder (which supposes the tangential force to be mechanically, and not steam-wise imparted,) a less effect is certainly obtained through the medium of the crank than by any other less practical means (such as the rack movement,) but then, unless absence of effect be absurdly taken to indicate the presence of power, such diminution implies as a matter of course a diminution in the development or expenditure of power, which is anything but a waste of power. Accordingly, the slightest examination of the subject will show, that the expenditure of steam diminishes in precisely the same proportion as the engine loses in efficiency. "The great source of error," says Mr. Tate, in No. 913, "relative to the crank, appears to be the confounding of two things in themselves very distinct, viz.: *statical* and *dynamical* force." Yes, this is true in regard to the mathematicians, but not so as to practical men, who, by the very character of their pursuits, are preserved from this error; whilst the former, for the same reason, are very liable to fall into it. A notable instance of this may be seen in the case of "Kinclaven," who, accomplished a mathematician as he is, strenuously denied in your pages that locomotive power is developed in the ratio of the cubes of the velocities, when in opposition to atmospheric resistance estimated as the square. But there is another source of error, namely, that to which I have just referred, arising simply from the ambiguity of language, for in a dynamical, as well as in a statical point of view, there is certainly a loss, that is to say, a *deficiency* of power, through the adoption of the crank; inasmuch, as all the mechanical conditions, except the expenditure of power, being the same, a less amount of efficiency is obtained from those conditions by the crank than by other less practical means; and consequently, a greater relative loss is entailed from friction and other sources of waste. Now, the fallacy consists in confounding that dynamical deficiency of power, with a waste of power, as though its expenditure was also the same.

Very few practical men have been betrayed into any error on this subject, but chiefly mathematicians and speculative schemers, untutored by experience or devoid of a sound judgment. Mathematicians, however, possessed of practical talent, or rather men of practical views, who have subordinated the study of mathematics to their own purposes, are beginning to recognise the application of the principle of virtual velocities to this subject. But the practical man requires not any such aid, if presented to him arrayed in all the formality of the calculus; for the principle of virtual velocities is no mathematical mystery, but

is the dictate of observation and common sense. Power, in reference to mechanical uses, is power only as it is active in producing effects; loss of power, therefore, is a phrase without a meaning, except as implying a misemployment of power upon inappropriate effects. There can be no such thing as its destruction; it must be spent in doing something, and its waste must consist in its doing that which we do not want. Now the practical man reasons thus in regard to the steam-engine and the crank, and in many other cases besides. He sees an incessant expenditure of steam, or of power; he sees it employed in producing rotary motion in opposition to resistance, which is what he wants; and except in overcoming friction, he does not see that it is occupied in doing any thing else, so far at least as the crank is concerned; and as he knows that power cannot be lost in doing nothing, he *sanely* concludes, in spite of all diagrams, tables, and demonstrations, mathematical or mechanical, that there is no power lost at all! As to the same conclusion being drawn from the calculus and the higher analysis, it is a fool to this conclusion of common sense; and yet the mathematicians, I doubt not, will claim all the credit of putting the poor bewildered practical man in the right path, though after having first done their best to lead him astray. It is, however, to practice and experience, by persisting in the use of the crank in opposition to all crude schemes and cruder theories, that we are indebted for an experimental demonstration of the value and correctness of this simple and beautiful contrivance.

Your correspondent "M," has furnished you in a recent number (921) with an account of what he considers to be an experimental demonstration of the loss of power attendant on the use of the crank. It is very singular that it did not occur to him, how necessary it was that he should not only compare effects with each other, but causes with their respective effects. Under certain circumstances of crank movement, he found a deficiency of effect as he might well have anticipated, but he neglected to ascertain, what he was sure to have found, that the power put forth was proportionally less. Here is a striking instance not of confounding statical with dynamical force, but of distinctly different ideas with each other relating to dynamical force, under the same word "loss," by making it stand, in an inference from effect to cause, for deficiency in the one, and for waste in the other.

It would be doing injustice to many of the ingenious men who have endeavoured to bring the rotary engine to perfection, to suppose that they were induced to do so by a wish to save the power alleged to be lost by the crank. There are many other reasons, and valid, why a good rotary engine would be a valuable invention. Undoubtedly under the most favourable circumstances for each, the reciprocating engine will always be the most efficient; but this would not be a fair comparison whereon to pass a judgment universally, for there are many cases, when the circumstances being *the same* for each, the duty done by the rotary engine may be the greatest; and others, where, though the performance should fall short in some degree, circumstances of convenience and durability may make it the more desirable engine of the two. Where, for instance, great velocity of rotation is required, and especially when intermediate gearing for producing it is inadmissible, or at least is not adopted, as in the locomotive, the reciprocating engine works at so great a disadvantage, both as to efficiency and durability, that projectors of rotary engines may well hope to be able to do better, and the more so, from these circumstances being not merely less unfavourable, but absolutely advantageous, for one or two classes of this kind of engine. I have seen statements, but in which there certainly must have been some mistake, by which it would appear, that the duty done by locomotives, is not more than two or three millions of pounds for a bushel of coal. The waste of power it is generally admitted is very great; a rotary engine, therefore, even though it should have its efficiency diminished by one half through the principle of its action, but which sustains only a moderate further loss by its mode of working, would exact a far greater amount of duty in such a situation, if the statement alluded to be correct. Whether, however, the construction of a rotary engine can be such as to admit of being placed on the axle of the driving wheels, and

whether on the whole the efficiency would be greater than what the present engines possess, are problems I fear yet to be solved; but there is nothing in the nature of things, which must necessarily continue the latter at least to an unsuccessful issue.

It must be remembered, that it is only to engines of a class which admits or demands a great velocity of rotation, that any advantages can be conceded; and then only in the particular cases to which that circumstance is adapted. This condition being observed, compactness and lightness, as well as simplicity, will be qualities superadded to suitability for special purposes; this is self-evident, whatever authority may attach to quotations in your pages to the contrary notwithstanding. But in all ordinary cases of slow movement, the reciprocating engine must ever maintain its superiority. This has been amply and most ably proved by Mr. John Scott Russell, both in the paper inserted in numbers 913 and 915 of your Magazine, extracted from the *Encyclopædia Britannica*, and in a prior paper inserted in No. 776, abridged from the Transactions of the Society of Arts for Scotland. But I think he has stated the case too strongly, because universally, against the rotary engine. The public are, however, much indebted to him; his disquisitions will effect great good, in deterring from fruitless invention, and an unprofitable expenditure of time and money. Still, it may not be useless to direct the attention of inventive talent to that particular case in the subject, when it may not be exerted in vain. It appears to me, that, notwithstanding the wasteful principle on which it would act, an engine of the emissive kind is that which is most likely to succeed, for all the difficulties of construction peculiar to the rotary movement in other forms, with all the attendant friction, wear, and leakage, would be avoided. Whatever loss it would sustain, (except a trifling amount arising from aeriform resistance and from axle friction,) would be referable solely to its principle of action, and it is worthy of particular remark, that this loss is not necessarily one-half.* There is a loss to this amount in engines generally, when the masses on which action and reaction take place are both put in general motion, and when that of the reacting mass constitutes nothing to the useful effect, but this may or may not be the case, according to the mode of construction. Of course, either actually or potentially, the respective *momenta* can in no case be otherwise than equal, but this is not to be confounded with mechanical efficiency. Time is a necessary element in the one, but not in the other. It is by confining attention exclusively to momenta, that mathematicians have so often been betrayed into error in practical matters.

Again, the momentum of the motive mass may, in theory, be imparted wholly to the resisting mass, but it will depend upon construction, to what extent it can be realized. There is an approximative instance of this in Mr. Whitelaw's patent modification of Barker's mill. The tendency of the spiral form of the tubes is, to appropriate much of that momentum which otherwise the water would have possessed at its exit from the machine. And here I must be permitted the opportunity to record, that precisely the same contrivance, with this object in view, was communicated to me some ten years since, by Mr. Exley, of Bristol; but Mr. Whitelaw has the further credit of bringing his excellent practical talents so to bear upon the working details of the engine, as to second in practice its superiority in constructive principle; by which means it is from all accounts rendered a very efficient hydraulic engine. But it is far from being a perfect one, inasmuch as the force with which the water issues from the pipes (and it can make no difference, as Mr. W. appears to intimate it does, whether it be in the radial or tangential direction) is altogether a loss of power. I believe, however, that the engine is really more efficient in practice than Mr. Whitelaw's theory of it would make it to be; that, besides other action, there is that of oblique impulse on the curvilineal sides of the tube; and hence, that the jet of water at its exit retains compara-

* "The theory of machines of simple emission has been frequently and fully investigated, and the result is, that there is no possibility of obtaining by simple emission, more than one-half of the whole power of the steam, so as to make it available to useful mechanical effect. The other half is wasted in giving off its impulsion to the air, or is expended in a current equally unavailing." See Mec. Mag., vol. xxix. p. 194.

tively but little force. In no other way does it seem possible, that the duty done by the engine can amount to 75 per cent. of the power.

Craig's rotary emissive steam-engine being simply on the plan of Barker's mill, (the improvement referring merely to the shape of the cross section of the arms, for the purpose of lessening the resistance given to them by the steam in their rapid revolutions,) is more purely an engine of recoil, and, consequently, is very defective in construction, as well as in principle. It is the more so, from the motive power being steam, which, rushing at so immense a velocity into a vacuum, (if, indeed, that mathematically inferred velocity can practically be relied on,) demands a greater velocity in the arms, to obtain the maximum effect, than is admissible in practice. Besides which, there is the disadvantage of reducing the speed to within useful limits. All emissive rotary steam-engines must be held to be radically defective, unless the construction be such that, without any material diminution of effect, they be able to work at once at the required velocity; not, however, so much on account of loss sustained by the conversion of one speed into another, as on account of the much greater loss (which such inability implies) arising from only a partial appropriation of the power. Such an engine, in the case of the usual moderate velocities, would in many instances be more convenient, though less efficient, than a reciprocating engine; in the case of very high velocities, it would, under peculiar circumstances, be equally or even more efficient, as well as more suitable in respect to durability and other particulars; and in the case of very small engines, it would be superior, both in point of convenience and efficiency. From experiments I have myself made, I am persuaded such an engine is practicable.

I would, in conclusion, avail myself of the opportunity of remarking, how vain and fruitless are all mathematical investigations of hydraulic action in general, whether viewed as imparting or receiving impulsive force—whether it concerns engines or steam-vessels. How can it be otherwise? The problem of three bodies exercised the minds of the highest order of mathematicians for, I believe, the better part of a century; what, then, can be expected from human intellect, in tracing with any precision the multifarious disturbances and endless modifications which must complicate the movements, in its several parts, of so mobile a body as water; especially if the contention and mutual influence extends, as is probable, even to its constituent particles. Good sense and careful experiments are the best guides in these matters, and a sound practical intellect will go farther and do better than all the mathematicians that ever were or ever will be. In this very case, (Barker's mill,) what different conclusions have they arrived at; the modern mathematicians depreciating it, as much as Euler and Bernouille valued it; and what is by no means extraordinary, they prove not to be right in either case. It is, in fact, the peculiar character of mathematical disquisitions, in all that concerns the physical operations of things, to be always in extremes, to be always wide of the truth in one direction or the other, inasmuch as the poverty of the science in reference to these matters, admits only of limited and one-sided investigations. These notions may appear to be very heterodox in the opinions of those who highly venerate and put great faith in every thing appertaining to the mathematics; but they should remember, that though demonstration is necessarily true, it does not necessarily contain the whole truth, and that part of the truth is in this, as in other cases, and more especially in practice—*error*.

I am, Sir,

Yours, respectfully,

BENJAMIN CHEVERTON.

DEMONSTRATION OF THE THEOREM PROPOSED BY NAUTILUS, P. 53 OF THIS VOLUME.

Sir,—At page 53 of your present volume, I promised to demonstrate the theorem there proposed. As four months have since elapsed, and no other person has undertaken the task, it is time I should redeem my pledge. I therefore beg to send the following demonstration, premising that, for the sake of convenience, I have altered the enunciation of the proposition, to that which (mathematically speaking) is a

synonymous description of the quadrilateral.

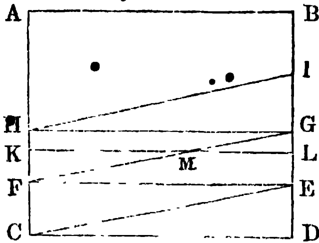
I am, Sir, &c.

NAUTILUS.

Proposition.

In any quadrilateral whereof the four angles, and two of the opposite sides, are equal; each of the angles is equal to a right angle.

Let A B C D be an equi-angled quadrilateral, having side A C equal to side B D; each of the angles at A, B, C, and D, is a right angle.



For if the angle A C D be not a right angle, let it be greater: draw A C E equal to a right angle, take C F equal to D E, and join E F; then (by 16. 1) A F E is greater than a right angle: draw A F G equal to a right angle, and take C H equal to D G, join G H, and A H G is greater than a right angle: draw A H I equal to a right angle, &c., and this triangulation may be continued to any extent upon the lines A C, B D.

Let K L be any straight line intersecting the sides A C and B D at equal distances from C and D; therefore, it must either coincide with one of the lines E F, G H, &c., or it must lie between two of them; in either case it must intersect some one of the lines C E, F G, H I, &c.; let M be the point of its intersection with F G, therefore, K M F is a triangle right-angled at F, and consequently, (17. 1.) less than right-angled at K. Therefore, if A C D, be greater than a right angle, any straight line intersecting D B, C A, at equal distances from C and D, must make with A C, on the side of C, an angle less than a right angle; but A B is such a line, therefore the angle B A C is less than a right angle, but it is also (because it is equal to A C D,) greater than a right angle, which is impossible. Therefore, it is impossible that the angles of the equi-angled quadrilateral A B C D can be greater than right angles, for if A C D be greater, B A C must be less, and no equality can exist between them.

Neither can the angles be less than right angles; for, if possible, let B D C be less than a right angle: draw B E C equal to a right angle, take C F equal to D E, and join E F; again, since B E F is less than a right angle, draw B G F equal to a right angle, take C H equal to D G; join G H, &c. &c. Let K L be any straight line intersecting D B, C A, at equal distances from D and C; let it also intersect G F at M; therefore, G M L is a triangle right-angled at G, and consequently, M L D is greater than a right angle (16. 1st). Therefore, if B D C be less than a right angle, any straight line, intersecting B D and C A at equal distances from D and C, must make with D B, on the side of D, an angle greater than a right angle; but A B is such a line, therefore, the angle A B D is greater than a right angle; but it is also (because it is equal to B D C) less than a right angle, which is impossible.

Wherefore, since it is impossible that the angles of an equi-angled quadrilateral can be either greater or less than right angles, they are equal to right angles.

Q. E. D.

Leeds, May 10, 1841.

PRESERVATION OF LIFE FROM FIRE BY AN IMPROVED MODE OF HOUSE BUILDING.

Sir,—The readiness with which you have inserted my crude conjectures on the possibility of propelling vessels, by means of a fluid in action, against one that is inert, strongly testifies your desire to promote every possible improvement in art, and encourages me to lay before your readers a plan of a very different nature, and which carries with itself demonstration, and the certainty of success. Contriving minds are wearied with comparing the numerous proposals offered to the public of late for effecting the saving of life from accidental fire in buildings, every one of which is accompanied with uncertainty; but if I can show you one that would render the loss of life nearly impossible, to either the infirm, the aged, or the infant, that is always ready at hand, and renders the

escape from the top of a house to the street as safe as from the lowest floor—which affords an easy way of securing property caught up in haste, and gives a safe access to persons employed in extinguishing fires—and which, after all, the service it has rendered will be a considerable saving in the restoration of the house,—if all these, and some other advantages, which for brevity, I have not enumerated, be taken into consideration, I am sure you will not refuse promulgation to my new plan. It is simply this, to pass an act of parliament, that in future no new houses shall be constructed whose staircases shall not be of stone—inclosed between party walls of a thickness suitable to the dimensions of the house—lit from the roof by a skylight, and with an exit leading to the street door, having no connexion with the building except by the entrances from the several floors, where, for perfect security the doors might be of thin cast iron, connected by an iron frame to the walls, into which walls might be inserted iron cantilevers for the support of the floorings of the house, in which case there would a be saving of timber far greater than the expense of the cantilevers. If the houses were burnt to ashes, these stone staircases would remain intact. I am aware, that the first cost would startle the builders, but when we take into account that such staircases would never be consumed, and the additional rent a house so constructed would command, as to the saving of insurance, property, and lives, I do not think such an act would be objected to by the legislature, and that in process of time, numbers of old houses would be rendered safe by adopting this principle, which proposes that the whole staircase shall be enclosed in sufficient party walls.

I am, yours, &c.

GEORGE CUMBERLAND, Sen.

Culver-srteet, May 8, 1841.

MR. ADCOCK'S SPRAY PUMP, &c.

Sir,—Having seen in your journal the extracts which you have published from the Report in the *Liverpool Courier* of Mr. Adcock's Spray Pump, I am induced to offer a remark for that gentleman's consideration, if he has not already met with it.

I have not sufficiently investigated the matter to feel assured that it is possible for more water to be raised from a mine combined with air, than in a mass, by the same amount of power, although I fancy *not:* but if it is so, an extract from another pamphlet which appeared in the same number (930), by B. Boyman, Esq., upon the "Condensing Cylinder Engine," very forcibly struck me as being very important to Mr. Adcock: for, has Mr. A. considered that he is by his invention going to substitute a rotative engine in the place of the now lifting engine,—that he is going to substitute an engine that requires, upon an average 8 lbs. of fuel p. h. p. for one that requires but 2½. *Ægrescit medendo.* Mr. A.'s plan ought, at least, to bring up three times as much water by the *power* employed as the single-lifting engine of Cornwall does to make his, a *superior* plan to the old one. Has this been sufficiently thought of before by Mr. A.? For if not—does not Mr. Pilbrow's engine make a vast change in the prospects of Mr. A.'s plan?

I should feel it a favour if Mr. Adcock would take the trouble to state the difference he finds (if any) in the *duty* of his mode of lifting water to the old; in reference to *coals consumed,* not *power* employed.

I am, Sir,

Yours respectfully,

V.

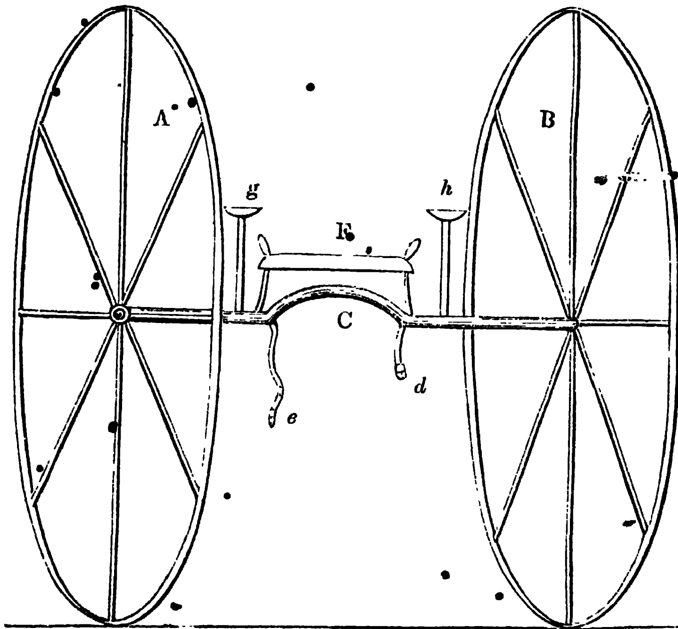
June 11, 1841.

IMPROVED VELOCIPEDES.

Sir,—In your last monthly part you have inserted a letter from a gentleman respecting the construction of velocipedes, and a reply from Mr. Baddeley, intimating that no useful vehicle of the kind has ever been constructed. I am inclined to agree with him in this opinion; but I remember some three years since, seeing in the Clapham Road, a machine which appeared to me (as far as great speed and little labour went) to answer the purpose. I am no mechanic, and therefore you must excuse the crude description I herewith send of the machine in question.

It consisted of two wheels A B, 7 feet in diameter, connected by a bar curved in the middle at C, so as to admit the body of the person propelling it, and a leather strap and buckle *d e,* fastened

the party to the bar; a handle F, projected in front, by which the machine could be guided; and there were two crutches *g h*, (if I may so term them) which supported the weight of the body, and enabled the party to rest occasionally on his route; the whole concern could be lifted without trouble; indeed, I do not believe the weight altogether exceeded 36 lbs.; the wheels were very light, and made of lance wood, and the inventor, a poor Deal sailor, or fisherman, said he could make a very excellent one for 5*l*. With this velocipede, (which was propelled as the first machines were by the feet in the action of walking,) this man had made repeated journeys from Deal to London, and back: also from Brighton and other places without greater fatigue than one would feel in taking a long walk, and yet the distances were accomplished in



the same time as by the coaches. I should certainly have had one built for my own USE, (not merely *amusement*,) but for one circumstance, viz., the singularity of an individual being seen flying along the road between two gigantic wheels, and the eclât of which, I confess, my modesty would not allow me to undergo. Should you think this description worth any thing, you are welcome to it; perhaps it might serve as a hint to those who are curious in such matters, and should your correspondent, Mr. G. Lynch, wish for further information respecting it, I shall be happy to communicate with him any morning he may favour me with a call. In the mean time, believe me to remain, yours respectfully,

JOHN FARTHING.

Cornhill, June 1, 1841.

CRAIG'S ROTARY STEAM ENGINE.

Sir,—No new invention, however useful or ingenious, can be introduced to the public, but down come the theoretical, semi-mathematical, demi-semi-practical writers of journals called scientific, with their twenty horse power

prejudices, and their one donkey power knowledge, to trample upon it.

There is an article in "The Athenæum" of last Saturday, written by one of this tribe, upon Craig's Rotary Engine, and the writer concludes—that, as Hero did not make the principle answer, Avery could not—and as Avery could not, Craig cannot! We might as well argue that because Savery's engine did not work economically, Watt's could never do so; or, that no mechanical arrangements or adaptations can make any difference in the utility of a principle—or, because some scientific reviewers are noodles, all their successors must of necessity prove the same.

The public, however, are too wise to listen to *theory*—they are only to be convinced by *facts*. Let the learned reviewer make experiments upon any one of these engines now in operation—let him test the power, weigh the fuel used, and calculate the water evaporated, and the duty done, and if he finds, as he will, that they are more economical than piston engines, let him in candour exclaim, "Write me down an ass."

I am, Sir,
Your very obdt. servt.,
W. E. S.

PROPELLING BY THE EJECTION OF WATER.

Sir,—I see in your Magazine of the 10th instant that Mr. Geo. Cumberland, sen. proposes propelling a vessel by the ejection of water. It is now six years since I commenced making experiments upon a steam-boat to be propelled by the compression of water. At that time business called me to the West Indies, where I continued my experiments, and found the result to exceed my anticipations.

The advantage of my boat is, that it is applicable either for canals or sea-going vessels; it makes no eddy in the water, nor does it expose its propelling power or any of its machinery to the aim or fire of an enemy. I can reverse or stop the boat instantly, without touching or stopping the engine. The whole of the machinery is very simple, and may be applied to men of war, merchantmen, or steamers, at a very trifling expense, and without any injury whatever to the vessel.

I am, Sir,
Yours, respectfully,
W. H. Rastrick.

May 4, 1841.

STEAM VESSEL AND CARRIAGE ALARUMS.

Sir,—Observing a letter from Professor Murray in a late number of your Periodical, relating to one inserted a few weeks before, as to a "Gong" alarm for railroads and steam-vessels, claiming a prior intimation on the part of that gentleman, and alluding to the possible arrangement of the machinery to allow of its adoption, permit me to state, that in November, 1839, I submitted to the Lords of the Admiralty, a drawing of a simple adaptation of machinery for that very object as to steam vessels, but substituting a bell for the "Gong," *which had been originally proposed by Captain Smith, as I noticed in the paper accompanying my drawing*, and which, as less resembling the roar of the sea, occurred to me as preferable. My drawing was accompanied by a specification, and I proposed to add a simple scale of signals by which the bell and steam whistle might be made to indicate, by the variety of their sounds, the course the vessel was at that time steering; therefore, I think my claim is prior to both Mr. Murray's and that to which he alludes. Though too young and unknown in the profession to affix my name to this communication, I feel it due to communicate my name, with the address, privately, to yourself, in case you or any of your correspondents should consider it worth while making any inquiries on the subject, when I shall always be happy to show my invention and give every information in my power.

A Young Engineer.

THE ROCK HARMONICON.

"Sermons in stones,
And good in every thing."

On Saturday a first musical performance of a most extraordinary and highly pleasing description was given at the Royal Musical Library, Lower Grosvenor-street. The performers are brothers, fine good-looking Cumberland lads. The instrument—if we are permitted the expression—comprises a series of stones, common whinstone, such as that found in the Cumberland quarries. These stones vary in length from four feet to six inches, in breadth about three or four inches, in thickness one or two. They are struck with wooden mallets by the performers, and have a compass of five octaves and a half. The tones produced are equal in quality, nay, sometimes superior in mellowness and fulness, to those of the pianoforte under the fingers of a skilful player. Difficult chromatic ascents and descents are performed by the youths on these rude materials with a brilliancy and crispness truly wonderful. In this manner they played on Saturday "The Even-

ing Hymn," several melodies, Scottish airs, and other pieces, and elicited much applause from a company of musical amateurs. Mr. Richardson, the father of the lads, and the inventor of the "Rock Harmonicon," was present; he is a stonemason by trade, but possesses considerable musical talents. He was daily in the habit of working at the rocks in the Cumberland mountains, and in pursuing his avocations, experience taught him that almost every sound might be obtained from the material which he met with in the course of his labours. Having discovered that the stones best calculated for his purpose were only to be met with among the rocks of the romantic Skiddaw, he began to explore the mountain in search of the musical treasures which it contained. The inventor bore these stones home upon his back, and after immense labour and time, chiefly stolen from the night, after his family had retired to rest, he succeeded in bringing to its present state the sweet-toned instrument now submitted to the refined musical taste of the metropolis. In arranging the blocks, hammering, cutting, &c., the instrument occupied thirteen years. The blocks of stone are placed upon a frame about five yards long, the lower part of which acts as a sounding-board. The stones are so placed that a piece of music may be played in any key with the greatest facility and fidelity. Nor are the unaffected manners, the truly English looks, and modest demeanour of the young performers the least attractions, and we sincerely trust that, before many days elapse, her gracious Majesty Queen Victoria will have her attention directed to the subject, and be pleased to command a performance.—*Morning Advertiser.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

FREDERICK THEODORE PHILIPPI, OF BELFIELD HALL, CALICO PRINTER, *for certain Improvements in the Art of printing Cotton, Silk, and other woven Fabrics.*—Petty Bag Office, May 25, 1841.—These improvements relate, firstly, to the mordants used in dyeing printed fabrics; and, secondly, to the mode of raising or fixing the colours in the printed pieces.

The mordants for various colours are as follows:—

For standard Yellow.—3lbs. of nitrate of lead, 5lbs. of sugar of lead, dissolved in one gallon of boiling water, with the usual thickening.

For Blue.—30 gallons of water, 4lbs. of indigo in powder, 6lbs. of copperas, and 10lbs. of slaked lime in powder; to 15 gallons of the clear liquor thus produced, 2 quarts of liquid muriate of tin are added, and the mixture strained through flannel to a thick pulp; to 3 quarts of this pulp add 1 quart of gum water, 2lbs. of calcined farina, and 4 ounces of muriate of tin in crystals.

For Green.—5lbs. of sugar of lead are dissolved in 1 pint of acetic acid, in an earthen vessel, in a hot-water bath; when cool, add 4 quarts of the pulp above mentioned, with 2½lbs. of calcined farina, and 4 ounces of crystalized muriate of tin.

For Olive.—Mix 15 quarts of the standard yellow liquor, with 5 quarts of gum water, 1 quart of iron liquor, and any usual thickening.

For standard Red.—Dissolve 4lbs. of alum in 1 gallon of boiling water, and add 2½lbs. of each, white and brown sugar of lead, and thicken with calcined farina.

For Orange.—To 2 quarts of the standard yellow liquor, add 1 quart of the standard red, and thicken with 2lbs. of calcined farina.

For Buff.—To 3½ quarts of the standard yellow liquor, add 1 quart of the standard red, and thicken with 3 pounds of calcined farina.

For Brown.—To 14 quarts of the buff liquor add 1 quart of iron liquor, and thicken with calcined farina.

For Drab.—To 8 quarts of the standard yellow liquor, add 12 quarts of gum water, and 1 quart of iron liquor, and thicken as last.

For strong or deep Red.—To 3½lbs. of alum dissolved in 1 gallon of boiling water, add 1½lb. of each white and brown sugar of lead; to 1 quart of this mixture, add 6 oz. of calcined farina, and when cold 1¾ ounce of crystalized muriate of tin.

For pale Red or Pink.—To 8lbs. of alum in 2 gallons of boiling water, add 3lbs. of carbonate of soda, and 2lbs. of sugar of lead; to every quart of this mixture, 3 quarts of gum water are to be added.

For Black.—To 1½ quart of vinegar, add 1 quart of iron liquor, and thicken with 1½lb. of flour, starch, or calcined farina.

For Purple or Lilac.—To 1 quart of iron liquor, add 6 quarts of vinegar and 10 quarts of water, and thicken as last.

For raising or fixing these colours, 100lbs. of carbonate of soda are dissolved in warm water, to which, when cold, 150lbs. of cow-dung are added, and the mixture allowed to stand 24 hours. Or 50lbs. of carbonate of soda dissolved in warm water, are mixed with from 20 to 25lbs. of bi-carbonate of soda and 50lbs. of cow-dung. Any other substance containing a sufficient quantity of ammonia may be used in lieu of the cow-dung.

The raising of the colours is effected by passing the printed fabrics through either of the foregoing mixtures.

NATHANIEL BATHO, OF MANCHESTER, ENGINEER, *for certain Improvements in Machinery, Tools, or Apparatus, for planing, turning, boring, or cutting Metals and other substances.*—Petty Bag Office, May 25, 1841.

The first improvement consists in forming the tools of planing machines with two cutting edges.

The second relates to the lathe, slide rest, and slotting apparatus. The centres or spindles of the head-stocks are placed as near as possible to the back of the lathe-bed, and the gearing brought to the front, thereby giving the tool a much more solid foundation when turning large work. The improvement in the slide-rest is a motion for working the carriage on which the cutting tool is fixed. On the under side of this carriage, a box with two ears is fixed, containing a nut working upon a screw: the screw has a spur-wheel cast upon it, gearing into a second wheel attached to a counter-shaft; upon this wheel, is a skew spur-wheel, gearing into another skew spur-wheel fixed upon a cross-handle shaft, which may be turned by hand or by power.

Another improvement in lathes consists in providing two tool boxes or carriers, with slide motions at the back and front of the carriage for cutting screws, or sliding backward and forward. A further improvement consists in the following slotting apparatus: —a large bevel wheel in connexion with the "following headstock" is fixed upon the end of a shaft that works underneath the barrel of the headstock; into this wheel a bevel pinion works, attached to the end of a shaft carrying the live and dead pulleys which give motion to the apparatus, and a spur pinion that takes into another spur pinion keyed upon the end of a screw inside the headstock. When required for slotting, a face-plate is fixed upon the end of the first-named shaft, the larger bevel wheel acting as a face-plate at the reverse end: these face-plates are each provided with a dove-tailed groove and slide, in which adjustable crank pins are fixed, connecting and extending from these crank pins to the hollow spindle of the headstock, to which they impart a horizontal reciprocating motion; so that if a proper tool is fitted to the spindle, all the ordinary work of a mortising or slotting machine may be performed.

The third improvement is in the engine for screwing bolts, and consists in the mode of traversing the cutting dies to and from the bolt to be screwed. For this purpose the back of each die is furnished with a dovetail piece sliding in a groove in the die-plate, and to each die is attached a right and left-handed screw, turning in nuts fastened upon the die plate; a pinion on the outer end of each screw takes into a corresponding pinion on a shaft running parallel with the die plate, so that as this shaft revolves the dies will move backward or forward.

The fourth improvement relates to drilling and boring machines, and is as follows:—A worm keyed upon the driving shaft, takes into a worm at the foot of a vertical shaft, at the top of which a similar worm takes into another worm upon a horizontal shaft; at the other end of which there is a pinion working into a rack attached to the drill or boring bar spindle.

The fifth improvement consists in an apparatus for squaring nuts, to be applied to the slide rest of a lathe; upon the slide rest, two sockets are screwed supporting adjustable carriers, in which a spindle is mounted for the purpose of holding the row of nuts to be squared by a cutting tool revolving upon the lathe spindle. The same contrivance is applicable to grooving screw taps and other matters, a suitable tool being fixed to the lathe spindle for that purpose.

OLIVER LOUIS REYNOLDS, OF KING STREET, CHEAPSIDE, MERCHANT, *for certain improvements in machinery for producing stocking fabric or frame-work knitting.*—(A communication.)—Petty Bag Office, May 25th, 1841.

This is a new arrangement of the working parts of the machine, designed principally for the purpose of driving the machinery by power.

In front of the machine a mitre-wheel is mounted upon a bracket fastened to the lower part of the framing, and turned by gearing from the main shaft; a groove on the face of this mitre-wheel carries a band which, passing over tension pulleys, is attached to a sliding thread-conductor, which slides upon a horizontal bar fixed to the front of the frame work, and carries with it the bobbin upon which the thread is wound to feed the machine: the thread passes from the bobbin through a tubular conductor to the needles.

The horizontal bar to which the needles are attached, forms part of a vertical rocking frame or lathe, which vibrates upon a shaft having its bearings in adjustable arms, hanging from a back shaft fixed to the end frames of the machine.

The sinkers are formed at the ends of levers, turning upon a horizontal rod fixed in the moving sinker-frame, which is pivoted in the end standard.

The presser-bar is attached by arms, pivots, and brackets at each end of the lathe, and receives motion by means of connecting rods from cams on the main shaft. The slur-cock for depressing the sinkers, slides upon a horizontal bar fixed in a bridge which rises from the sinker-frame. The ends of a

cord are fastened to two large pulleys turning loosely upon the main shaft, but which are alternately engaged by means of clutches, thereby giving the required traverse to the slur-cock.

EDWARD HENSHALL, OF HUDDERSFIELD, YORKSHIRE, CARPET MANUFACTURER, *for certain improvements in making, manufacturing, or producing carpets or hearth-rugs.*—Petty Bag Office, May 26, 1841.

The first improvement consists in an apparatus for winding two or more threads, side by side, upon a bobbin from separate hanks, thus preparing the threads for two or three thread warps, before it is placed in the loom. The apparatus consists of a light frame, the upper part of which supports the reels of yarn; the driving shaft is placed at the lower part of the machine, and carries a series of wooden drums, which by friction of contact drive the bobbins on which the thread is being wound. Two or more threads being taken separately from the hanks are passed through the eyes of a stationary guide-rail, thence through a traversing guide to one of the bobbins on which they are wound, side by side, so that the two or more threads will readily unwind from the bobbins at the same speed, and preserve a uniformity of length and tension. The traversing guide-rail is made to traverse by means of a lever worked by an eccentric on the driving shaft.

The second improvement is an apparatus for printing or stamping spots, squares, or stripes, in different colours, across a number of yarns or threads. Any number of bobbins filled with yarns are mounted on spindles at one end of the machine; the yarns are passed between friction guide-rollers, and one or more threads are drawn through each space of a slay; from ten to twenty of such collected threads are passed through the reed, side by side, forming a band. A space equal to the width of the band of yarns being left in the reed, another band of yarns is similarly introduced, and so on alternately till the reed is full. The ends of all the threads being confined in a nipper or clasp, are drawn tightly across the printing table and subjected to the ordinary operation of block printing. After being printed, the threads are hung up to dry and afterwards finished by passing them over a hot drying cylinder, when they are wound in hanks upon reels.

The third improvement consists in an apparatus for converting the warp throughout its entire length, into a slight gauze-work or fabric, by weft threads put in at intervals of about an inch; for this purpose a creel of bobbins is placed in front of a loom, the warps of which are passed through the healds and reed and attached to the warp beam; then at every inch a weft is thrown in, converting the warp thread into a kind of gauze-work, which is gradually taken up by the warp-beam. The warp-beam being placed in front of the printing table, the fabric is printed, dried, and finished ready for weaving.

The fourth improvement consists in weaving in a common loom, Brussels or similar carpets, either in white or in any colour intended for the ground of the pattern, and afterwards giving it any pattern or device in the ordinary mode of block-printing.

MILES BERRY, CHANCERY-LANE, PATENT AGENT, *for certain improvements in looms for weaving.* (A communication.)—Petty Bag Office, May 27, 1841.

These improvements are shown as applied to carpet looms, but are not confined thereto. The first consists of a modification of the jacquard machine, in which one trap-board and harness are made to balance the other in their alternate movements, whereby the power required to drive the loom is equalised. The trap-boards are perforated as usual, and are supported by guide-rods and stands bolted to the frame of the loom, and are connected by bars with vibrating levers. The journals are placed at the top of the machine, being fastened to guide-rods, which are connected with vibrating levers; these vibrating levers, as well as those before mentioned, are worked by cams, by which an alternate up-and-down motion is communicated to the trap-boards and journals. The second improvement relates to the machinery for delivering the warp and taking up the finished cloth. Thethird improvement consists in a mode of constructing shuttles and shuttle boxes, and of connecting them with the framing of the machine, instead of attaching them to the lathe as hitherto done.

The shuttle is made of plate metal, with a projection at each end, from which a round pointed pin extends, having a notch in its upper side, and on the top of the projections are feathers or guide-pins; there is also the usual pin for holding the bobbin, with a spring to secure the bobbin to it. The shuttle-boxes are formed of plate iron, with a pin turned up at right angles on one edge, by which they are secured to arms affixed to suitable fulcrum shafts; they are furnished with guide-bars and springs, to guide and secure the shuttle, and also with a pin to hold the shuttle when it enters the box. The shuttle-boxes are made in pairs, and are equipped with suitable mechanism for raising or lowering them, when a change of filling or wool is required. The shuttle is handed through the warp by reciprocating arms, the ends of which are cylindrical, and have a hole to receive the round pins of the shuttle; these are held in

the arms by catches taking into the notches of the pins. The feathers or guide-pins enter grooves in the arms and keep the shuttle from turning. The shuttle being attached to one of the arms by its pin, is passed through the warp halfway across the loom, where it is met by the second arm, to which it becomes attached by its pin entering the hole in the end of it, being at the same time released from the first arm, and is carried the remainder of the distance across the loom by the second arm to which it has become attached. The fourth improvement is an apparatus for stopping the loom, when the filling breaks or is exhausted: and also for preventing the selvage of the cloth from drawing in, when the filling is prevented from escaping freely from the shuttle. The apparatus for stopping the loom consists of a cam acting on a vibrating rod, which, when the filling breaks, turns a horizontal shaft, and withdraws a short arm projecting out of a groove formed in a rod attached to the top of a vertical shaft. This rod, on the shaft being released, disengages a clutch on the main shaft, and throws the loom out of gear.

For preventing the selvage of the cloth from drawing in, two hooks are employed in the following manner:—when the lathe is falling backward, the warp opening and shuttle starting, the points of two wire hooks are raised up forward of the filling, so that when the shuttle passes, the filling which it carries draws round the point of the hook, on that side of the loom from which the shuttle is passing, and draws the hook towards the selvage of the cloth, until an arm affixed to a vertical axis which supports the hook strikes against a stand, and prevents the farther approach of the hook, thereby preventing the filling from drawing in the selvage of the cloth when its delivery from the shuttle is in any way obstructed.

JOHN CLAY, OF COTTINGHAM, GENTLEMAN; AND FREDERICK ROSENBERG, OF SULCOATES, YORKSHIRE, GENTLEMAN, *for Improvements in arranging and setting up Types for Printing.*—Petty Bag Office, May 27, 1841.

A fount of types is provided, which are arranged in a series of perpendicular grooves formed in two vertical plates at the top of the machine. A series of keys are placed at the lower part of the front of the machine; on one of these being depressed, a horizontal rod forces the required letter through an opening at the lower part of the groove on to a horizontal plane, along which it is conducted to a receiver at the end of it. It is then received on a moveable support, which gradually descends as the types are placed upon it one above the other, until one line is completed when it is level with the bottom of the receiver, being separated from it by a sliding fork, which supports one side of the line during its formation. The sliding fork is next removed, and the line of types advanced a distance equal to their width, along a horizontal bar at the bottom of the receiver, which serves the purpose of a composing-stick. The types are then supported on one side by an upright sliding in a dove-tailed groove in the horizontal bar, and receding as the several lines of type are completed, and on the other side by the sliding fork, which has been returned to its place. The selection and setting up of the types, therefore, is effected by the compositor pressing down the proper keys, as in playing a piano-forte or organ. Many of our readers will doubtless notice ths striking similarity between this machine, and one for the same purpose patented by Messrs. Young and Delcombe, and noticed at p. 317 of our last volume.

JOHN BUCHANAN, OF GLASGOW, COACH-BUILDER, *for certain Improvements in Wheel Carriages, whether for common Roads or Railways.*—Petty Bag Office, May 28, 1841.

The first improvement is in the carriage of four-wheeled vehicles, and is described as applied to a chariot. A perch extends longitudinally beneath the body of the carriage, one end being firmly fixed to the body, and the other end pivoted to a cross-bar behind that to which the hinder axle is attached. To the front cross-bar, one end of an iron bar is firmly fixed, its centre being supported by a cross stay; the opposite end is formed into a pin or rod working in a box or open socket attached to a keeper by a pivot bolt, which allows the box to revolve so as always to be at right angles to the pin. A piece of wood attached to the bottom of the body serves for the perch to traverse upon, and the keeper being also attached to the bottom of the body, serves to retain the perch in contact with the piece of wood. The perch also works between a similar keeper and the hind cross-bar. When the pole turns the under fore-carriage (with its axle and pair of wheels) round the perch-bolt in the usual manner, it acts upon the body by means of the pin or rod working in the socket, causing the upper fore-carriage and the body to move away from each other in contrary directions laterally, thereby moving the body out of the way of the inner fore-wheel.

The second improvement consists of an improved mode of applying cross-springs to wheel-carriages, by which the use of side springs and a connecting perch is rendered unnecessary. This improvement is described as applied to a two-wheeled carriage, in which the spring is suspended from the axle by the middle, a block of wood being placed there; each end of the spring is connected

by a shackle with two scroll irons below it, the other ends of which are attached to the shaft.

The third improvement, which is an improved carriage spring, is composed of two or more steel plates kept from contact with each other by blocks of wood interposed in the middle of their length, and connected at the ends by loose links, shackles, or rollers.

The fourth is a gearing for connecting railway carriages together, so as to maintain a uniform degree of tension throughout a train, whether in a state of traction or propulsion. One end of a rope or chain is affixed to the axle guard from whence it passes through a block back to the buffer-rod, to the inner end of which it is attached by a block. The block is attached by a right and left handed screw to the corresponding block of the next carriage, and is screwed up till the rope is drawn tight, and the buffers bear upon each other. The play of the buffer-rod will always take up the slack of the rope, and so maintain a uniform degree of tension throughout the train.

Lastly, the patentee describes a method of applying braces to carriage springs, which consists in attaching the brace to the frame of the carriage behind the spring, at such an angle as to support the same, and to obtain the necessary degree of "draw" on the brace, without the aid of the heel flap or stag.

George Holworthy Palmer, of Surrey-square, Civil Engineer; and Charles Perkins, of Mark Lane, Merchant, *for improved constructions of pistons and valves for retaining and discharging liquids, gases and steam.*—Petty Bag Office, May 28, 1841.

The improved piston, which may be likewise used as a valve, is composed of an elliptic plate of metal, the smaller diameter, of which corresponds with the internal diameter of the working barrel, while its other diameter is one fourth larger. Near the centre of the larger diameter there is an adjusting joint to which the piston-rod is attached, so as to permit the piston to swing freely in the direction of its major diameter so as exactly to fill the barrel in which it works. When used as a valve, the joint is removed, and it is screwed to an axis placed directly across its major diameter near its centre, and turning in bearings in the sides of the barrel. The second part of the invention comprises a double adjusting balancing valve, consisting of a plate having two openings in it, one of which is closed by a valve beneath the plate, and the other by a valve above it; these valves communicate with each other by a bent arm, turning upon an axis placed centrally between the two, so that they both open and close together.

The patentees claim the right of making or constructing the elliptic pistons or valves of any one or more materials, in one or more pieces, and with any auxiliary precautions to ensure their action under different applications; and also their use and application to various purposes. And as regards the double adjusting balancing valve, they claim the right of making, constructing, or forming the same of any one or more suitable materials, or of one or more pieces; and in the application and use of them, under different modifications, to steam-boilers, steam-engines, pumps, &c., or other purposes to which they may be applied.

Charles Winterton Baylis, of Birmingham, Accounting-house clerk, *for an improved metallic pen, to be called the Patent Flexion Pen, and improved Penholder.*—Enrolment Office, June 12, 1841.

The patentee observes that metallic pens as usually made are deficient in the elasticity possessed by the pens made from quills; and that although apertures of various kinds have been made between the shoulders and point of the pen, none of these plans have afforded the property required; and that there are a very great number of persons who are wholly incapable of writing with the steel pens at present in use. One of the principal defects of metallic pens, is their continual tendency to catch in the paper, and tear it in the up-strokes, which is the case more or less with all pens after they have been a short time in use.

In order to remedy this defect, and to afford increased elasticity, the patentee bends the point of the pen upwards, so that the angle made by the slit of the pen and the surface of the paper written on is much more acute than in the ordinary straight pen. With the latter, the direction of the slit is in a line parallel with the axis of the penholder; but with the patent flexion pen, the line of the axis of the handle, if prolonged downward, would fall considerably behind the point of contact between the slit and the paper.

The improved penholder has its lower end bent up to a similar angle, so as to give to the ordinary straight pens, when fixed in it, the peculiar inclination found to be so beneficial to their performance. The claim is to the construction of pen shown, which is called the Patent Flexion Pen; and also the construction of penholder, called an Improved Penholder. The objects of the improvements being to obtain greater elasticity and freedom in use, than belong to ordinary metallic pens; which effects are obtained by the methods of constructing pens and penholders described. The patentee likewise claims any variation of construction depending on the same principles, or producing by the same or similar means, the same or similar results.

JAMES MOLYNEUX, OF PRESTON, *for an improved mode of dressing flax and tow.*—Enrolment Office, June 15, 1841.

Within a strong cast-iron frame, is placed a table for holding the strick boards and intermediate slips; this table runs in or out of the frame upon small truck wheels on a pair of rails, and turns at its centre on a pivot pin for the convenience of presenting the stricks in opposite directions to the heckles, by turning the table end for end, when the flax, &c., has been heckled sufficiently in one direction. The boards which hold the stricks in this table, are precisely similar to those in silk machines, only that they are larger and stronger. The boards and slips are screwed firmly together, side by side, with end set screws, as in silk-dressing machines.

Lever segments, acted on by chains and a connecting rod raise the table, and cause the flax to approach the heckles gradually as they penetrate through it, completing the straightening of the fibres as they proceed. The combs or heckles are placed at intervals across an endless band running on rollers at each end of the machine; in order to clear the heckles as the work proceeds, another endless band revolves on wheels at one end of the machine, furnished with a series of brushes, which clean the heckles of the tow; the brushes being in turn cleaned by a stripper or doffer-wheel, which collects the tow and throws it into the tow box.

When the table has been raised to the requisite elevation, it touches a trigger lever, which disengages a ratchet wheel and allows the table to fall, its descent being moderated by a fly-wheel; a contrivance is provided for re-engaging the elevating apparatus.

The claim is to Dressing Flax and Tow on a machine as described, having the clearing and doffing apparatus, and the stopping bob, and weighted lever apparatus.

Intending Patentees, or Patentees of unspecified inventions, may have every needful information and assistance on moderate terms by application to the Office of this Journal, where also may be consulted the only Complete Registry extant of Patents from the earliest period (A.D. 1617,) to the present time.

RECENT AMERICAN PATENTS.

[From Dr. Jones's List in the Journal of the Franklin Institute, for February, 1841.]

FOR AN IMPROVED WHEEL FOR CARRIAGES, *Elisha Talles, city of Hartford, Connecticut, December* 27. The wheel is denominated a *Metallic Suspension Wheel;* and after describing it, the patentee says that he does "not claim the suspension principle, or the making any part of it of metal; or any thing in the shape of the spokes, or the securing them at each end by nuts; but I do claim as my invention and improvement, 1st. The rim of the wheel of the form and shape hereinbefore described. 2. The furnishing a metallic hub with a box, or boxing, which can be replaced when worn, and secured in its place, as described. 3rd. The sand valves in the manner and for the purpose described."

The rim of the wheel is so formed as to have a groove, or channel, around it, which is to receive wooden felloes, and these are to be secured in their place by hoop tire, in the usual way. The hub is cast with a perforation large enough to receive a metallic box or boxes for the axle to run in. The "sand valves" are washers, with rims, borne up by springs against each end of the hub, to prevent the entrance of dirt of any kind, and to keep in the oil.

FOR AN IMPROVEMENT ON BEDSTEADS, *Benijah Bosworth, Fayette county, Kentucky, December* 14.—This patent is for the mode of fastening the posts and rails together, and of tightening the sacking bottom. The rails are to be round, and have round tenons on their ends; the sacking bottom is to be attached to them by wooden pins and eyelet holes; and on the part which will become the under part of each rail, there are to be projecting pins inserted, three or four inches from each end, making in all eight such pins, an inch in diameter and two in length, with a neck turned near their outer end. Round these pins cords are to pass, like those used for tightening a frame saw, and the cords are to be twisted by means of a stick of wood, in the same manner, and thus the sacking is to be tightened.

The claim is to "the method herein described of tightening the sacking bottoms of bedsteads by means of the rope attached to the pins projecting from the under sides of the rails, and twisted by a stick."

NOTES AND NOTICES.

Dredge's Suspension Bridges.—We are happy to see that the admirable mode of constructing suspension bridges, invented by Mr. Dredge, is now making some progress not only in the good opinion of the scientific, but in actual adoption. One is being erected, under the direct superintendence of the patentee, over the Leven, near Loch Lomond, the length of which will be 300 feet; and two bridges, of the same construction, are also now about to be erected over the ornamental waters of the Regent's Park.—*Bath Journal.*

Asparagus Paper.—A paper manufacturer, of Ghent, has discovered that the refuse ends of asparagus make excellent paper, at half the expense of paper from rags, and that a still greater economy is obtained by mixing the pulp of asparagus with that of the beet root.

LONDON: Edited, Printed, and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; and W. C. Campbell and Co., Hamburgh.

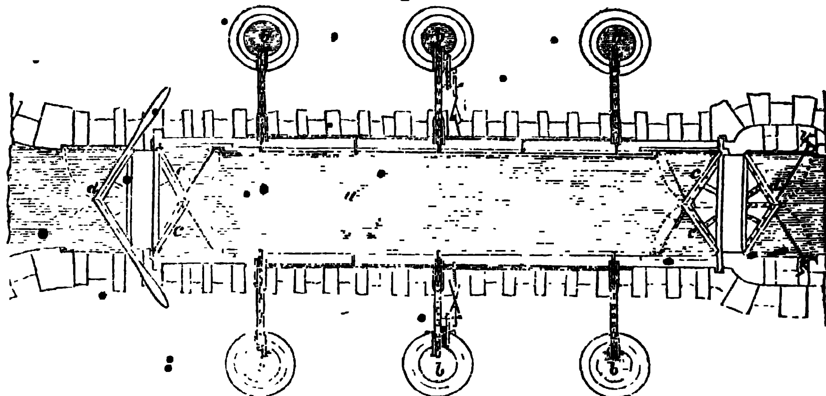
Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 933.] SATURDAY, JUNE 26, 1841. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

SALT'S PERPENDICULAR LIFT FOR RAISING VESSELS FROM A LOWER TO A HIGHER LEVEL.

Fig 1.



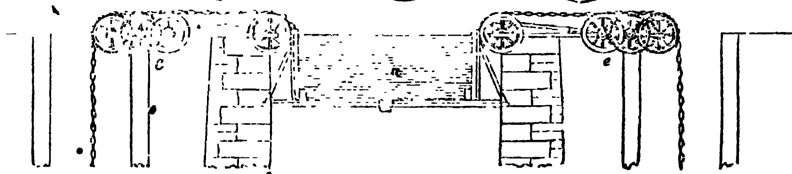


Fig. 3.

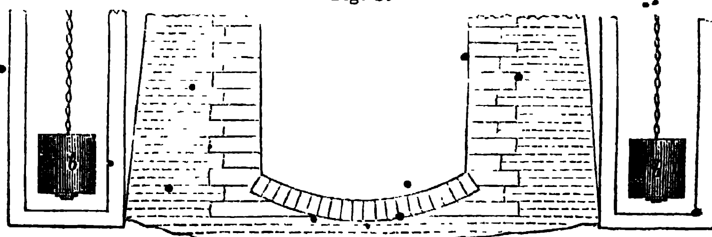
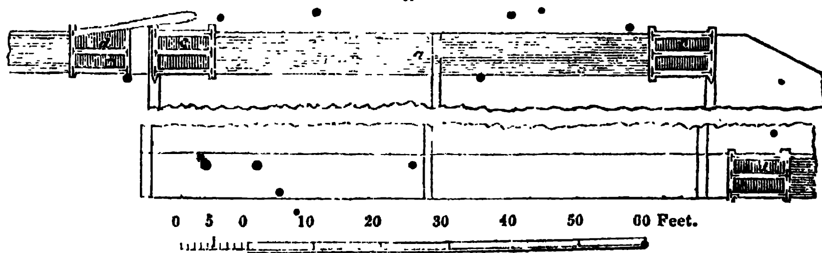


Fig. 2.



SALT'S PERPENDICULAR LIFT FOR RAISING VESSELS FROM A LOWER TO A HIGHER LEVEL.

Sir,—The accompanying plan for a more economical and expeditious mode of raising vessels from a lower to a higher level, was suggested by me some years since, and the subject having lately attracted considerable attention, I send you my plan for publication in your Magazine, if you deem it suitable.

In the plan, (fig. 1, see front page) will be seen the frame, with the gates at each end, also the gates at the upper and lower levels, with the necessary wells, weights, chains, brakes, &c., which are still further explained by reference to the elevation (fig. 2) and the cross section (fig. 3). The chains run over a cast-iron beam, at each end of which there is a wheel so constructed that the chain cannot slip when the frame is checked by the brakes. The wheels next the frame are made fast to a cast iron-shaft, which insures their all turning regularly. A basin is necessary at the lower level with a culvert under it, to let out any water that may remain in the lift.

The method of lowering and raising vessels by this apparatus is as follows: When the frame is at a sufficient depth to admit vessels to enter it, the brakes are made tight and the gates opened for the vessel to pass in; when the vessel has entered and the gates are shut, the brakes are to be eased, and a paddle drawn, to let out as much water as will cause the weights to overbalance the frame, when it will gradually rise, and it will not be necessary to check its progress by using the brakes, till it arrives near the top. When the water in the frame is within about 2 inches of the water of the upper level, the brakes must be made tight, and a paddle drawn to admit the water into the frame, which will then overbalance the weights again.

There are grooves in the wall for the purpose of keeping the frame from moving out of its place.

I am, Sir, yours respectfully,

SAMUEL SALT.

32, Mulberry-street, Liverpool, May 10, 1841.

Reference to the Engravings.

a, the frame; *b*, weights equal to the frame and the water contained therein; *c*, the frame gates; *d*, gates of the upper and lower levels; *e*, the brakes.

THOUGHTS ON STEAM CARRIAGES.

Sir,—Some papers falling into my hands by the death of a beloved relative, (who was at times a contributor to your Magazine,) I send you the following article on Steam Carriages. If you think proper to insert it, I shall probably send again at some future time.

I remain, Sir, with respect, &c.,

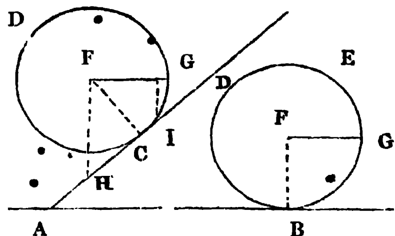
E. B.

On Steam Carriages.

The only method I have known employed to cause a carriage to move forward by means of a power within itself, is by giving rotation to the wheels. In all kinds of motion that takes place between the surfaces of bodies there is friction, or resistance, and according as the surfaces of bodies are smooth and polished, or rough and uneven, so is the friction greater or less. Different kinds of motion have also very different degrees of friction. A circular body that rolls over the surface of another has much less friction than a body that slides over a surface similarly situated. Friction also increases as the weight of the body is increased. Were all bodies perfectly smooth, so as to have no friction, all those capable of motion would have a tendency to occupy the lowest place possible. A body placed on a slope would slide or roll to the bottom. It is evident, then, that friction is a useful property of bodies; since, by it, we are enabled to cause a carriage to move forward, by making the wheels revolve. It is by it, indeed, that we are able to walk or move about; since, if there were no friction, we should slide or roll till we occupied the lowest part of the ground on which we were placed, and there we must remain. There are no bodies so perfectly smooth, but that they oppose some resistance to motion, more or less, and

the asperities, or unevenness, which all bodies possess, may be considered as standing out from the surface, and occasioning the different degrees of friction in different kinds of motion. A circular body rolling over the surface of another body may be considered as having its asperities drawn out of the asperities of the other body in succession, similar to the leaves of a pinion, in rolling along a rack—causing much less resistance to motion, than when one body slides over the surface of another, where the asperities may be considered as entering into each other, and must be broken down, or removed when motion commences, the same as a pinion sliding along a rack must break off the teeth in which it is engaged. It appears to me, that it is owing wholly to the degree of obstruction being greater in the one kind of motion than the other, that we are able to accomplish locomotion, or to effect the progression of a carriage by giving rotation to the wheels; since, were we to suppose both kinds of motion to offer equal resistance, or no resistance, and to place a carriage on a horizontal plane, and give a rotary motion to the wheels, the only thing effected would be the rotation of the wheels, as the inertia of the carriage would effectually prevent its moving forward. It is evident, then, that the asperities of bodies are essentially necessary for accomplishing locomotion, and that they act much in the manner of tooth and pinion; only that there is a limit to the action, which we now come to consider. Did this earth present but one continuous horizontal plane, there would be little difficulty in causing carriages to move over its surface: but since it is composed of every variety of declivity, from the steep and difficult ascent, to the gently falling slope terminating in a level plane, it becomes necessary to examine whereabout the two kinds of motion balance each other, what inclination carriages so constructed would ascend, and generally what inclines are to be ascended. Different kinds of bodies have also an effect on the degree of friction, since the wheels of a carriage will have more adhesion on wooden rails than on iron ones, perhaps as much on the common road as on wood; and the word adhesion expresses all the power by which a carriage is enabled to ascend an incline. It must be evident also, that on whatever surface a carriage is placed, the greater the uniformity of that surface the better, since every inequality is equivalent to increase of elevation to be ascended. The extreme limit that it can be possible for a carriage to ascend, must be an incline where a carriage that has the wheels locked fast will just stand without sliding down, but in practice it will be found to be somewhat less. Many that have been constructed have been enabled to ascend only a trifling incline. It becomes necessary then to examine what ought to be attended to in their construction to make them more effective.

And first, since the adhesion of the wheels to the ground is increased as the pressure or weight upon them is increased, the weight of the whole must as much as possible be thrown upon those wheels that have motion given them from the engine, and not be placed on trains to be drawn after the engine carriage. The next thing to be considered, perhaps, is less understood, and will require more explanation. It is the mode of applying the power of the engine so as to answer the purpose most effectually. In order to do this, we will first consider a carriage placed on the horizontal plane, A B, and it will be found that, in such a wheel B D E, the line of direction, F G, passes through the point of contact of the



wheel with the ground, and consequently, that it will not be affected by the action and re-action of the steam in whatever direction it may be employed, whether vertically or horizontally. But if we now consider the same wheel C D E, placed on an incline as A X, we shall find it to be very differently situated, since, when the point of contact of the wheel with the plane is C, the line of direction, or the per-

pendicular line, will meet the plane in H; and the way in which the steam is applied will now become a matter of importance, for if the steam act in the vertical direction, it will, by its reaction, lift as much weight off as presses upon G. Again, when the crank is in the opposite direction, F will be depressed with the same force as G is lifted.

On reconsidering what I have last written commencing with the words, "The next thing to be considered," I feel some misgivings as to its accuracy, and cannot but consider it somewhat problematical, and shall not therefore enter upon the details I had intended. The whole of the article is more an examination into principles than a statement of ascertained facts, and therefore, I shall take another view of the subject, which I will now explain. The cylinders are to be placed horizontally, and there must be twice the usual number, as they are to be single acting, or impelled by the steam in one direction only, the reason of which will presently appear. In other locomotive engines, where the piston is impelled in both directions by the steam, the position of the cylinders is a matter of convenience only, because the principle I am now endeavouring to establish—namely, the reaction of the atmosphere—cannot be of service. Suppose, in such an engine, the cylinders are placed horizontally, and the motion of the piston in one direction had caused the engine to re-act in the opposite; yet, immediately follows the stroke of the piston in the contrary direction, which acts as a counterforce, and thus they neutralize each other. Now let it be supposed, that the pistons are acted upon by the force of the steam in one direction only, and that the opposite direction to that which the engine is travelling, the re-action will assist in causing the progression of the engine, and it will be able to ascend greater inclines than it otherwise would do, since the re-action acts similar to an external force, pushing or drawing the engine.

The return stroke is to be accomplished in a manner similar to "Watt's Single acting Engine," by a side valve opening a passage between the bottom and top of the piston, and cutting off the communication with the atmosphere and boiler, thus causing the piston to be returned in a non-resisting medium; and when the engine travelled the contrary way, the steam could escape on the other side of the piston, all things being made so that the side of the piston which communicates with the boiler, and that which communicates with the atmosphere, can be reversed when requisite. After fully considering what I have now written, I believe the advantage would only be proportionate to the extent of surface of the pistons, and of the velocity with which they met the air; and consequently separate piston cylinders travelling very quick, merely as assistants, and unconnected with the wheels, would best answer. While on this subject, I will describe a method I had contrived many years ago for ascending inclines. The idea was taken from the manner in which a reptile moves itself along the ground by sticking by the hind part of its body, while it protrudes the forepart, and then sticking by the forepart while it draws up the hind part, and thus moves itself along. And now for the imitation—I made a carriage consisting of two independent frames of equal length and breadth — the one placed immediately above the other, and a little distance from it, and the front end of the under frame having a pair of wheels resting on the ground, while the back end, by means of a pair of friction wheels, rolls along a guideway inside the upper frame. In the same manner, the back end of the upper frame has a pair of larger wheels, resting on the ground, while the front end has a pair of friction wheels like the former, rolling along a guideway inside the under frame. The frames will thus allow of either the one or the other, as the case may be, moving along, as far as the guideway will permit. Each of the ground wheels has a ratchet wheel and click, which allows the wheels to turn in the forward direction only. The under frame is made as light as may be, and the top frame is made heavy, and the weight placed as much as possible over the hind ground wheels, which are attached to it, and which are the wheels driven by the engine when working the common way, as the other plan is intended to be used only where the ascent is difficult, which I shall now consider. Suppose the upper frame is stationary, and has a crank attached to it which has motion

given it, and from which a crank rod is jointed to the under frame. Since the wheels will not turn backward, the heavy stationary frame will push the lighter under frame forward; but now, when by the revolution of the crank it becomes the turn of the lighter frame to stand still, it will be unable to push the heavy upper frame forward, and therefore something more will be requisite, which I will try to explain. To the fore part of the inner frame is jointed a lever which extends to the back part, and has a wheel at the end of it which runs on the ground, and has a ratchet wheel and click attached to it. This lever also carries a short steam cylinder of considerable size, and which has fitted to it a piston, &c. The top of the piston rod takes hold of a lever which extends horizontally under the axle of the back wheels, and is jointed to the fore part of the under frame, as the other. On the axle of the back wheels there is a friction wheel turning loose upon it, and which also has a ratchet wheel and click to make it turn in the forward direction only, and it runs along this last mentioned lever when the steam presses it against it, and when the crank motion before described begins to act upon it. Of course the motion of the crank which causes the alternation of the two frames, and the action of the steam upon the lever, must correspond, that is, when the top frame is stationary the force of the steam must not press the lever, since it is then the under frame which requires to be moved; but when it is the turn of the bottom frame to be stationary, the lever must then be pressed with the full force of the steam, since with whatever force it lifts the top, it reacts with the same force against the bottom, and thus causes it to become a fulcrum by which to move the other frame forward. The model to which I have before alluded was intended for common roads, and the axis of the front wheels had an upright spindle by which they could be set in any oblique direction so as to wheel round when required. The crank to which I have before referred as causing the alternate motion of the upper and under frames, is placed on one side of the upper frame, while another axle on the opposite side, and, as it were, forming a part of the same line as the crank-shaft, has a catch or claw upon it; near the end of this same shaft is a socket, one end of which carries a catch, and the other end two cranks set square to each other, with two connecting rods from the cylinders. This socket can be thrown by a fork and levers, so that the catch takes the other catch when the wheels work in the common way, or thrown to the other side it takes the crank and commences the alternating motion. When intended for the conveyance of passengers, the unpleasantness of the alternating motion might be overcome by mechanical contrivance.

T. B.

Darlington, May 7, 1841.

STEAM NAVIGATION—RIVER THAMES STEAMERS.

Sir,—From time to time your Journal has noticed the rapid improvements that have been made in steam navigation, and your readers have often been astonished in perusing the account of some fresh wonder in the way of "a new Thames steamer which we are told beats all that has ever been heard of." London has always been pre-eminent for the number and the beauty of the splendid steam ships which frequent her port, but more particularly for those celebrated river boats which are unquestionably, as low-pressure ones, the fastest in the world. But it is at the present time, in the year 1841, that London presents to one interested in steam navigation the most striking view of the high state of perfection to which the energy and skill of her artizans have brought this science. Who would have dreamt, ten years ago, that it would be possible to go from the City to Gravesend in an hour and ten minutes? True it is that five out of the thirty miles are travelled over by railway to Blackwall; but would any person have been listened to, ten years ago, who would have had the hardihood to predict that a low-pressure Thames steamer would be able to run the distance between Blackwall and Gravesend in an hour? That such is the fact, and that it has been often done, I appeal to the many hundreds who have travelled by either of those splendid boats, the *Railway*, or *Blackwall*, which ply between those two places. These two

iron boats were built by Ditchburn and Co., of Blackwall, and were fitted each with a pair of 90 horse-power engines by Messrs. Penn, of Greenwich, and Messrs. Miller and Co., of Blackwall. They were placed on this station early in the season, at the instigation of the Blackwall Railway Company, and have hitherto met with great success. Of the two, the *Railway* is a little the fastest, and her speed was found by actual observation to be fully sixteen miles an hour! Last year your readers will remember that the celebrated Gravesend *Ruby*, so long the champion of the river, was considered to have been quite cast into the shade by the feats of several new competitors; yet I see by one of the morning papers, that this second-rate steamer made her passage from London Bridge to Gravesend (thirty miles) on the 7th of June, including seven stoppages, in the short space of one hour and thirty-five minutes. This gives her a speed of rather more than eighteen miles an hour! Why, the *Father Thames*, the celebrated iron steamer, which last year was said to have beaten this wooden steamer, and every thing else, hollow, made her fastest voyage this season in only one hour and thirty-six minutes. This is now the fourth season the *Ruby* has been running, and barely the *Father Thames's* second, and yet the former beats her rival with all the advantages an iron steamer has over a wooden one. Your readers also heard a good deal last year about Mr. Napier's flying *Eclipse* running to Margate and back in the day. This singular steamer, I find, is still running, but with poor success, and although working at a much higher pressure than any other Thames steamer, has been passed by the *Railway*. Another, and very handsome iron steamer named the *Orion*, built at Ipswich, with London-made engines, has commenced running this summer between London and Ipswich. I have not been able to ascertain her exact rate of speed, but this I know, that she has beaten the *Orwell* on two several occasions, and as that vessel is one of the fastest on the river, and nearly equal to the *Ruby*, her speed must be at a pretty high rate. The increase of small iron steamers plying to Greenwich, Woolwich, &c., &c., has been this year astonishing, and it cannot but be a source of gratitude that the citizens of London have now placed at their command the greatest facilities for rational and healthful enjoyment, and moreover, at the most trifling expense. Almost all of these vessels travel with great rapidity, and are much admired for their beautiful symmetry. If things, Sir, continue to progress year by year, at this rate, what may we not expect?

I remain, yours, &c.,
NAUTICUS.

London, June 18, 1841.

GAS MANUFACTURE—SETTING RETORTS, ETC.

Sir,—Having received many applications requesting further information upon *my economical mode of setting and working retorts for the production of carburetted hydrogen gas* (described at page 60 of your present volume), I forward you the following as answers to the numerous questions put to me, hoping they will be found sufficiently explicit by all parties interested in these matters.

All flues, and other such complications, are avoided by means of this coking oven, which renders it so extremely simple, that I think a full description sufficient; otherwise I would have forwarded a plan and section of the oven and retort.

It may be built either of stone or bricks, lined with fire-bricks, exactly as described in my former letter, keeping the top as near of a dome shape as possible, that the heat may be reverberated upon the retort, and burning slack whilst undergoing the process of carbonization; but built of either material, its cost would not exceed 10*l.* or 12*l.*

My first intention was to have placed two retorts side by side, but finding one more than adequate to the work required, I fixed it along the centre of the oven upon brick pillars 18 inches high; this retort was replaced in February last without inconveniencing the consumers, and without having another to work whilst it was so removed.

As to the length of time that such an oven will remain in good repair, I cannot pretend to say, but certainly it will be much longer than any other kind with which I am acquainted. The time that a retort will last is stated in my

former letter sufficiently near, although it was worked a fortnight longer than is stated therein. It was 1¼ inch thick, and had been in an oven upon the old principle a short time, before it was placed in the one referred to.

The retort is charged with from 1 to 1¼ cwt. of coal, according to its temperature, so that they may be worked out in three hours; the average quantity of gas which I have made from a ton of coal during the whole of the winter, is 11,500 cubic feet. The quantity given out by a charge varying with the heat of the retort, from 8 up to 15,000 cubic feet from a ton of coal, perhaps 15,000 may be the greatest quantity ever yet produced from a coal which gives a coke ⅔ of its original weight.

This was produced under a pressure of one inch of water, and I can guarantee the same result, to any one under similar circumstances.

It is not so much the quality of the coal upon which the quantity of gas given out from a given portion will depend, but rather the temperature at which the retorts are worked; although several other parts of the apparatus require the strict attention of the engineer, as they all conduce to the generating, as well as to the manufacturing processes.

If we work a retort at a low temperature, the bituminous part of the coal is merely converted into vapour, which has no sooner passed from the heated surfaces than it is condensed into tar and ammoniacal water, leaving little or no carburetted hydrogen; but upon raising the temperature considerably, these particles of tar in vapour no sooner leave the coal, than they come in contact with the ignited surface of the retort, whereby they are decomposed, the carbon adhering and forming the crust found lining the interior of old retorts,* and the carburetted hydrogen, naptha, &c. passing off by the exit pipe. Now it will be plain to any one, that the more intense is the heat of the surface which effects this purpose, the more capable will it be of volatilizing the whole of the products given out by the coal during the process of distillation, and of course, the less in proportion will be the quantity of tar and naptha produced.

It is by this principle that the tar must be consumed, either by an intensely heated surface or by passing it over a greater extent of surface moderately heated, and which I have no doubt I shall be able to effect ere long by a very simple and not expensive process.

I have been induced to give the above hints upon the generating of coal gas, that the principle by which I have obtained so great a quantity from a given portion of coal may be fully understood, and again assure you, that I have not gone to the outside in my calculations.

As by this means a retort may be kept heated from a blood red up to nearly the melting point of cast iron; so the quantities of gas generated may be varied, and also the length of time that a retort will continue to be fit for working.

I would advise to place only one retort in an oven at first, till such time as the men are used to the way of working it; when, I have no doubt, but two may be used with increased advantage.

Hoping I have not intruded too far upon your valuable pages, I remain,

Sir, your most obedient servant,

JOHN THOMAS.

Wem, Salop, April 13, 1841.

* As I perceive that this species of carbon is much harder when deposited upon an intensely heated surface, than upon one moderately so, perhaps it may be worth the attention of some of your numerous scientific readers to ascertain whether such deposit would take place in a platinum retort, or what kind of substance would be produced by a very intense heat in such a one. I think the subject is worthy of inquiry.

NEW THEORY OF MAGNETISM.

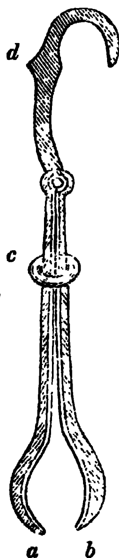
Sir,—Magnetism is no longer a mystery. Philosophers have all along agreed that magnets give out a fluid; but none ever thought for a moment that it was necessary for them to be supplied with it. It has been supposed, that if a magnet were in operation for a century, the fluid emitted from it, all proceeded from the interior of the body, so that if it had given out a ton of subtile fluid, this had all been contained in the interstices of a body, which at the same time, iron, fluid and all, did not weigh perhaps two ounces. So much for philosophy! Magnets do give out a subtile fluid, but they take it in before, or as soon as they begin to give it out. And when once set in motion, it continues

to flow through them, on the same principle that water rises in capillary tubes. This augments the pressure in the space into which it flows, and reduces it in the space from which it is taken. Thus if an ounce of atmosphere be taken from one pole and transferred to that of the other, there is a positive pressure of two ounces more at one pole than the other. This, and this alone, is the long sought solution, and furnishes a definition of attraction, repulsion and polarity, and will shed a new light on science.

I am, Sir,
Your most obedient servant,
GEORGE TOWLER.

St. Laurence, Norwich, May 12, 1841.

PARKS'S POCKET INDISPENSABLE.



The above sketch represents an ingenious and convenient little instrument, which our neighbour, Mr. Parks, No. 140, Fleet-street, has just brought out under the title of "A Pocket Indispensable, and hat or cloak suspender."

It is submitted as being useful for a great variety of purposes:—First, as a hat or cloak suspender in public assemblies, where pegs cannot be found: it is so constructed, that the hat is grasped by the prongs *a b*, closed by a slide *c*, and can be suspended from a button-hole—from a small nail—or any projecting part by the hook *d*. It is recommended to travellers in particular; it makes an excellent watch-hook—can be used as a cigar-holder, and in a variety of other ways.



PRINCIPLES OF BRIDGE BUILDING.

Sir,—The invention of bridges was the first step towards civilization, and without them, no doubt we should be as originally; therefore, their construction is well deserving the attention of every scientific man and journalist who aims at his country's good.

I am now induced to address you on the subject, from seeing in a late number of your journal the opinions of a few men who stand high as engineers in this branch of mechanics, which, if suffered to pass unnoticed, will be a tacit admission that their views are well founded, and the promulgation of which may lead to incalculable mischief.

Messrs. Rendall, Brunel, Donkin, and other civil engineers, have contended that heavy bodies are less liable to motion; in this they are right, but they forget that they are also less able to bear it. And according to their dogma, all that is required in suspension bridges, is rigidity in the platform or horizontal line, to be obtained only by vertical or horizontal diagonal trussing, or by additional weight. This of course infers that the horizontal line is almost every thing in suspension bridges, and the arch to be hardly deserving even a secondary consideration; but surely it must be clear to every body else, that the arch in every bridge, be its position upwards or downwards, is as essential towards the support of the structure as the horizontal line. I conceive that they are both equally as useful in all bridges, even as much so as the muscle and bone in the human arm. If the horizontal line be of such importance in suspension bridges as they have pointed out, then how is it that it is so much neglected in stone bridges? Truth in the one case must be truth in the other, as the same principle pervades both. Oscillation, undulation or vibration in suspension bridges, is only

motion in different directions, which originates in half of the suspended weight being balanced on the lowest point of the arch, and which multiplies directly as the length, and inversely as its depth. Consequently, the whole suspended weight is easily set in motion by the slightest force in any direction. The same holds good with the common stone bridge, but it is less perceptible, owing to the weight of the transit loads being so trivial, in comparison with the weight of the structure. In the Menai Bridge, if its suspended weight be a thousand tons, as the deflection of the arch is one fifteenth of its length, the strains in the chains at the centre are 3,750 tons, not an atom of which should be there, as it is but the extremity of two projections. And when this enormous load, which is composed of weight and leverage, is in motion, so extensively as Mr. Powis has asserted, no human mind can calculate the destruction to which the structure must be exposed in consequence. Besides, such a system is enormously expensive; the chains alone of this bridge are about 2,000 tons weight, while they need not be more than 50 tons—the masonry only one-fifth what it now is—the timber one-third. Neither does a bridge stand in need of any vertical or horizontal diagonal trussing. In short, there need be no timber used in suspension bridges, as iron and stone will answer every purpose, and these are very durable and cheap materials.

What I have now stated will not long remain mere assertions, as there will be, in the course of a week or two, in the Regent's Park, practical proof of its truth. I have now only to add, that in my humble opinion, the common arch, with good abutments in architecture, or for vaults and tunnels, whether it be upwards or downwards, when it is the segment of a circle, is a perfect piece of mechanism, as every particle against it is stationary, and is a component part of the arch, which in fact is self-supporting in the highest degree. But a bridge is exposed to transit load, which is ever destroying it; therefore, the common arch is any thing but correct or mechanical for the construction of bridges.

I am, Sir, your humble servant,

JAMES DREDGE.

Bath, June 18, 1841.

THE NEW THEORY OF THE UNIVERSE.

Sir,—We often see new systems of theories formed only to account for some particular phenomenon; some, although ingenious and apparently consistent with the objects which have occasioned them, are, however, incorrect enough to lead many into error, and from such causes indifferent or impracticable schemes are frequently pursued with enthusiasm at an extravagant cost; while others, more useful and easy, are neglected or retarded in their progress. The New Theory of the Universe will afford an opportunity to establish the true principles, so desirable in practical science.

I consider the firmamental fluid as unique. Absorbed in a state of positive cold, by a power inherent to a peculiar disposition of the matter, it passes to the state of positive heat: then the heat must be resident in that peculiar disposition of the matter, not as a fluid, but generated at the moment of absorption. It will remain latent till a decomposition, when the matter is volatilised and saturated by the fluid, constitutes its state of positive heat. The cause of having various fluids of positive heat must be various kinds of matter. If matter was an unique substance, its combination with the firmamental fluid would be varied by density alone, their affinity would be the same, and an equilibrium would soon be inevitable. If the different properties assumed by all inanimate substances were due to peculiar dispositions only, the pretensions of the alchemist to produce gold, would not be so much out of reason; but from my manner of viewing the things, the pretension of producing even the rudest material from substances which do not constitute the same, will remain a nonentity. Had the alchemist's skill been directed to the production of diamond,—although diamond is considered rarer and more precious than gold,—it would have been much more reasonable:—diamond is pure carbon—carbon is extensively found in combination with other matter — easily disengaged — and readily adapted to new combinations. I see no reason, therefore, why a concretion of pure carbon could not be obtained: then if the endeavour of the alchemist had been, in that case, crowned with success, we should have had diamond as we now have glass and crystal.

The inert quality of matter makes it obedient to the strongest impulse, and (as I expressed it in my first communication on this subject) there I find the plain principle of all motion and *mutation*. Let us consider all matter and substance in four different states. Solid, liquid, gaseous and fluid; and according to their different kind and admixture they will form bodies of different specific gravity.

Any quantity of matter so constituted, and under the immediate influence and pressure of the firmamental fluid, will form a globe, the solid and liquid matter at the centre, and the gaseous and fluid surrounding it as an atmosphere; and if there were in the universe a *fixed point* for the matter to rest upon, all matter would have gathered around it and stand still, pressed by the firmamental fluid. But as there is no such point, the matter is eventually formed into distant globes. Solids, forming a nucleus and buoyant by their atmosphere, are dispersed and floating at indefinite distances in the firmamental fluid, and their distances and motions are due to the law of specific gravity. The globular form of a body by equal pressure, and the precipitation or ascension of bodies by specific gravity, is a fact so easily observed, as to need no further illustration here.

Matter is nowhere in a state of positive rest; every mass or particle of it being incessantly carried away into the great *tourbillon* of the universe, and the apparent rest that we can appreciate is only relative to time and distances. Any particular motion from this apparent rest, performed in time and distance under our immediate control, is submitted to the same laws that influence the heavenly bodies. As long as a body, set in motion in a particular direction or round a centre, is urged by a sufficient power, it will continue to move in that direction, or round that centre; but if the original power ceases, or if in its progress the body encounters some obstacle, its peculiar motion would cease, either in a slow and gentle manner, or by a sudden stop. The body will then resume a state of relative rest, or acquire motion in a new course, and this is to be understood as well for solid and liquid matter, as for gaseous and fluid, without exception of light, caloric and electricity.

I should wish to know from E. A. M. if these observations are consistent with the principle of her theory.

R. C.

March 17, 1841.

DECIMAL MONEY.

The following ingenious proposition of a system of Decimal Money for account and circulation, has been printed and circulated anonymously. It is dated "Suffolk, January, 1841." [ED. M. M.]

1. The MEANS proposed, are the *pound* and *farthing* for computation, and for circulation, all the coins in present use, except the penny and half-penny.

2. The MODE proposed is, from and after the 1st January, 184 , the pound sterling to consist of 1,000 farthings, and money of account to be the pound and farthings, 1,999*l.*

3. The silver shilling to be fifty farthings, and all multiples and sub-divisions of it in gold or silver of proportional value in farthings.

4. The penny and half-penny to remain at four farthings and two farthings, the silver shilling (of 50 farthings) being equal to 12½ of the first, and 25 of the latter.

5. All pence and half-pence to be received at the Mint, and stamped with the words and figures $\frac{5}{\text{Farthings}}$ $\frac{2\frac{1}{2}}{\text{Farthings}}$ and henceforth to pass at 10 and 20 to the silver shilling of 50 farthings.

6. Gold and Silver Coins to be stamped with their value in farthings; the Sovereign 1,000 farthings, the shilling 50 farthings, and so forth with all gold and silver coin.

7. New gold and silver coins to be issued of like form and value to those in present use, having impressed on the one side the value in farthings, in words and figures, and on the other, the head of the Queen.

8. A large number of copper coins to be issued, avoiding quarters and eighths of the shilling; the value in farthings being impressed on the one side in words and figures, and the head of the Queen on the other, viz. —1 farthing,.. 1½ farthing,.. 2 farthings,.. 5 farthings,.. and 10 farthings...

9. The PRINCIPLES on which this project is founded are the following:—1. Men accept willingly a small change in things well known to them, when the old names are retained. Attempt to alter their old well-accustomed habit of dealing with any given thing, by naming it anew, or by substituting a new thing with a new name, and generations pass before a change in a matter of every day use or occurrence is accomplished. 2. When it is wished to get rid of a name and retain the greater part of the thing which it represents, render as easy as possible the mental process to be undergone on what it is wished to retain; and as difficult as may be the mental process on what it is desired to reject.

10. The mixed decimal and duodecimal computation of money is carried on, the decimal by the shilling of 20 to the pound, the duodecimal by the penny of 12 to the shilling, and 240 to the pound. The penny and the half-penny as money of computation must be got rid of.

11. The confusion purposely engendered between the old penny of four farthings, and the penny new stamped as five farthings, and the retaining at the same time the familiar denomination of farthing at nearly its old value would, it is expected, accomplish this object in a short period.

12. An ignorant man purchasing half a shilling's worth of any commodity one day, and receiving in change for his silver shilling six and a half old pence unstamped, and making a like purchase on the next day, and receiving five old pence stamped with their new value of five farthings in change, would be puzzled for an instant only, when asked, "How many farthings are in a penny?" "Four." Well! Government stamped pence are now worth five farthings. "See! here is the stamp." Falling back on his old acquaintance, the farthing, he would be satisfied, although he might not clearly understand what had befallen the penny. So on receiving six and a half old unstamped pence in change instead of six-pence, he would easily take in the reason. "The shilling is now worth fifty farthings. See this new shilling marked so, and this old shilling stamped at the Mint fifty farthings, the unstamped pence you have got are worth only four farthings."

13. Accounts would be kept by educated people in decimals immediately, that is to say, in pounds and farthings, 1,000 of the latter to one of the former. With the ignorant and wilful, they would be somewhat longer coming into use; but in the mean time all acquainted with accounts would accomplish the conversion of pounds, shillings, and pence, (the first 1,000 farthings, the second fifty, and the last five,) by inspection, or by a very short and simple process.

14. In the course of time, when decimal computation had become familiar, new coins of two shillings each, and ten farthings each, with the names of royals and groats if desired, as suggested by Professor de Morgan, might be issued; ten of the former to the pound, ten of the latter to the two shilling piece.

15. The change in value proposed, making 1,000 farthings instead of 960, represent the pound sterling, is smaller than takes place frequently in the price of copper; and compared with the fluctuation in price of most commodities bought and sold by copper money, it disappears as a significant quantity.

16. The disturbance in existing habits is trifling in amount, so as scarcely to be worthy of notice; the advantage of decimal notation in money of account and coin to educated people is incalculable.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for the purpose.*

WILLIAM PIERCE, ASTLEY'S ROW, ISLINGTON, GENTLEMAN, *for improvements in the preparation of wool, both in the raw and manufactured state, by means of which the quality will be considerably improved.*—Petty Bag Office, June 9, 1841.

The object of these improvements is, to loosen and detach the resinous, glutinous, gummy, or other adhesive matters from the fibres of wool, and thereby render them soft and pliant, and make them more susceptible of receiving colours.

This object is accomplished in the following manner:—A mixture is made of eight gallons of water, with one gallon of the strongest pyroligneous acid, in which the wool is completely immersed, and occasionally stirred, for one or more days, according to circumstances.

The wool is then taken out of the acidulated mixture, and thoroughly rinsed in soft water, after which it is washed with soap and water, or other alkaline solution, in the usual manner; it is then pressed and dried, and is ready for manufacturing purposes.

Woollen cloths may be steeped in the acid mixture before being dyed, but must remain in longer than would suffice for the raw wool. Any other acid may be used instead of the foregoing, the proportions being varied accordingly.

The claim is to the application of an acid, animal, vegetable or mineral, for the purpose of loosening, extracting, or detaching the superfluous animal matter from wool, and thereby making it of a finer quality, and rendering it more suitable for receiving colouring matter in the dyeing process.

JAMES DAVIS, OF SHOREDITCH, ENGINEER, *for an improved mode of applying heat to certain steam-boilers.*—Enrolment Office, June 16, 1841.

This improvement consists in the application of heat to such boilers as are susceptible of such an arrangement, through the medium of coke ovens, or such like enclosed fire-chambers placed within the fire-tube, or fire-cylinder of such boilers, so that the flame and heat produced within the said ovens shall pass off through an aperture or apertures, in the crown or arch of the same, by transmission, and also by radiation from the external surface of the said oven, to the inner surface of the fire-tube of the boiler. And further, when two ovens are used for this purpose, one placed over the other, in an arrangement of lateral openings or vents in the lower oven, directed so as to conduct the flame and heat from the lower oven upwards, and between the sides of the upper oven and the inner sur-

face of the plates of the fire-tube of the boiler, and thence passed off from over the upper oven by ordinary flues. The apertures or vents of both ovens being so arranged as not to interfere with, or essentially to diminish, the reverberatory principle of the said ovens. And further, in the introduction of a metallic, brick, or tile floor, or false bottom placed at a distance below the bottom of the lower oven, or of the oven where one only is used, upon which combustion may readily be produced, for the purpose of aiding the conversion of the fuel into coke.

The claim is to the application of heat for generating steam in steam-boilers, or generators by placing an oven or ovens, with such arrangements of flues and apertures, and false bottoms as aforesaid, within the fire-tube of a steam-boiler, or steam generator, as aforesaid.

ANDREW PRUSS D'OLSZOWSKI, OF ASHLEY CRESCENT, GENTLEMAN, *for a new and improved level for ascertaining the horizon and the several degrees of inclination.* (A communication.)—Enrolment Office, June 16, 1841.

This invention consists in a certain application of the pendulum, or loaded bob, for the construction of a level, whereby the horizon, or the inclination of any plane or surface with reference to the horizon, may be ascertained and determined.

The pendulum may be made in any of the usual ways, and of any of the usual materials, and suspended from the centre of the upper side of a rectangular frame, in such a manner that the point at its lower end may traverse freely over a semicircular arc, which is graduated to 90,° on each side of the zero or lowest point. The pendulum is to be supported upon a cylindrical axle moving in cylindrical bearings, or in any other more approved and frictionless manner. The rectangular frame is to be very firmly constructed so as to preserve its shape unaltered. The instrument is graduated by first fixing the zero point, and then dividing the intervals on either side in the usual manner. By placing the upper limb of the frame against any upright erection, its correspondence with, or its deviation for a true vertical line, may be ascertained; whilst its lower edge being placed on any surface will at once indicate its relation to the true horizon. Several forms of the instrument are shown and described, one adapted for the pocket—and another, in which the graduated arc is placed at the upper part of the instrument, the weight hanging below the centre of support, and the pointer being placed above it.

The claim is to the application of a pendulum, or loaded bob, to the construction of a level, as hereinbefore described.

WILLIAM TUDOR MABLEY, OF WELLINGTON-STREET NORTH, MECHANICAL DRAFTSMAN, *for certain improvements in producing surfaces to be used for printing, embossing, or impressing.*—Rolls Chapel Office, June 17, 1841.

These improvements consist in certain modifications or applications of the new art of electrography to the production of printing or embossing surfaces, as follows.

Firstly, In the production of a printing, embossing, or impressing metallic cylinder, plate, or block, having a device or pattern formed thereon, suitable for the above purpose, such device or pattern constituting one perfect or connected design, produced from an originally engraved or otherwise executed portion of the said design. In illustration of this part of the invention the patentee takes an ordinary dinner-plate for which it is desired to produce a printing surface; a portion (say one-fourth) of the design is engraved, or otherwise executed by any of the ordinary means; a mould, or matrix of the portion of the engraved design is then obtained by compressing soft metal upon it, or by a casting in wax, plaster, or other similar materials, remarking that if the mould is made from any substance which is a non-conductor of electricity, it must be made a conductor by the application of plumbago, or other substance commonly used for that purpose. The moulds described as being used are themselves made by the agency of voltaic electricity, to do which, the parts on which the metal is not to be precipitated are varnished, or otherwise insulated, and the engraved portion of the design is placed in a solution of sulphate of copper, and connected with the positive pole of a voltaic battery, or a single cell apparatus. When a sufficient thickness of metal has been deposited, the first copy is removed, and a second formed, and so on until the required number (in this case four) is obtained. These are soldered together, forming the entire design, which is placed in the solution and connected with the battery, when the copper is precipitated upon it in one consolidated plate, ready for the operation of printing. The mode of dealing with irregular figures, and of changing the patterns, is explained at length.

Secondly, A mode of joining together engraved, or otherwise executed metallic plates, so as to form one connected surface, which consists in forming a groove along the edges of each plate where the junction is to take place; the detached parts are then brought together and held by clamps or otherwise. All parts of the plates except the grooves are then varnished or otherwise insulated, the grooves are washed with dilute nitric acid, and the whole placed in the metallic solution in connexion with the battery, when

the metal will be deposited in, and adhere to the grooves, firmly uniting the several pieces together in one mass.

Thirdly. In obtaining an extended plain surface to an engraved metallic plate whereon a continuation, or an addition to the subject already formed, may be engraved. This is to be done by taking a mould of such engraved plate (electrograph preferred), and soldering or otherwise attaching thereto a plain metallic surface, and submitting the whole to the action of the battery in the usual manner, when a plate will be obtained in one mass containing an additional surface whereon another portion of a whole design may be engraved.

Fourthly. In certain modes of producing suitable surfaces as aforesaid, such modes not requiring the ordinary original process of engraving. A flat metal surface (plated being preferred) is coated over with wax, or other such matter as can readily be removed. The composition recommended by the patentee consists of bee's-wax, turpentine and lamp-black, mixed together so as to form, when cold, a substance easily cut through and removed. On this surface the required design is traced, and those portions down to the metallic plate removed that are to form the print. The composition is then black-leaded and placed in the metallic solution, and connected with the battery, when the metal will be precipitated thereon; the composition being melted away or otherwise removed, will leave the required printing surface. If an embossing surface is to be produced, the process is precisely similar, except that for the same pattern, those portions that were for a printing surface cut out, must now be left, and *vice versa*. For cylinders, a hollow cylinder in lieu of a flat surface is employed, but the patentee prefers making them in three segments, and uniting them by the voltaic process as before directed. According to the second plan, a stone is taken, capable of being eaten away by the application of sulphuric or other acid, on which the design intended to be produced is traced, and the remaining surface of the stone protected by a coating of varnish, lithographic ink, or similar substance. The stone is then submitted to the action of dilute acid, when those portions which have not been covered by the varnish or other such protecting matter will be bitten away. The whole is then coated with varnish, wax or other such matter, and covered with plumbago, or other conducting substance, and placed in the solution in connection with the battery, when the required metallic surface will be produced suitable for printing or embossing. Another mode is to take a piece of sheet-lead, or other soft metal, and cut, or punch out the required design through the same; it is then placed on a flat piece of metal, in which position it must be held firmly, and the mode which the patentee prefers for doing this, is to tin the two surfaces, and having brought them closely together, to apply heat, by which they become soldered together. The whole is then properly stopped out and submitted to the voltaic action, when the metal will be deposited, giving the required printing surface in relief. In order to produce cylinders in this way with relief printing surfaces, a hollow metal cylinder is employed within which the punched sheet of metal is properly placed.

Fifthly. A mode of producing surfaces as aforesaid, such surfaces being suitable for printing, or printing and embossing in various colours.

Suppose it is intended to print from a plate having engraved, or otherwise obtained, the design with the pattern sunk therein; two moulds are taken of the whole design by the voltaic process, which will of course be in relief. Then with a scraper, or other suitable tool, those parts of the design which would print the red colour, for instance, are removed from one of the plates, and the parts which would print green from the other plate; this being done, electrotype copies of the plates are obtained, the one containing those parts of the design which are deficient in the other, and *vice versa*. In this way any number of plates can be produced to work together, one for each colour.

Sixthly. In the application and use of dies formed by the agency of voltaic electricity, for the purpose of embossing or impressing horn, hoof, or tortoise-shell in the manufacture of buttons. The metal is precipitated by voltaic electricity upon suitably formed moulds or matrices, which may be produced in a great variety of ways; having engraved, or otherwise produced one die containing the required design, on copper or silver of a convex form (for then the finally produced copy will be ready to be applied to the die), it is placed in the battery, and the metal precipitated upon it. When a sufficient thickness of metal has been obtained, it is removed, filed flat at the back, and a number of such dies mounted on a strong block in order that they may be worked together.

Seventhly. A mode of mounting or attaching seals, book-binder's tools, or other such instruments, used for impressing; such tools or instruments being produced by the agency aforesaid. By this means the precipitated copy is made to attach itself in the act of deposition upon the holder of such precipitated copy, the arrangement being modified in various ways to meet particular circumstances.

Finally. A mode of producing seals for impressing on wax, or other such substance, which consists in setting up, or putting together moulds of such seals. A set of initials similar to ordinary types are provided, one or more of which are put together according to the seal required, blank pieces being placed at the sides, &c., to afford a sufficient margin; the mould thus prepared is placed in the metallic solution, and the metal precipitated by the voltaic agency.

The claim is to the eight improvements epitomized numerically above.

RECENT AMERICAN PATENTS.

[From Dr. Jones's List in the Journal of the Franklin Institute, for February, 1841.]

FOR DRESSING PAPER PULP; *Nathaniel Hebard, Dorchester, Norfolk county, Massachusetts, December* 27.—The ordinary pulp dresser consists of a plate of metal having numerous narrow slots cut along it, for straining the pulp. In cleansing these out when they become choaked, the openings are gradually widened, and the instrument injured. The object of this invention is so to construct this instrument as that the openings may be narrowed and widened at pleasure, and set to any degree of fineness. For this purpose, strips of metal, of equal widths, are attached to a frame by joint pins at one of their ends, and at the other by similar joint pins, to a sliding bar. When the strips stand at a right angle with a part of the frame to which they are jointed, they are at sufficient distance apart to clear them from all obstructing matter, and by means of the sliding bar to which they are jointed at the opposite end, they may be made to approach each other in any required degree. The claim is to this arrangement of the parts.

FOR AN IMPROVED RAIL ROAD CHAIR; *Britton M. Evans, city of Lancaster, Pennsylvania.*—This chair is intended to obviate the necessity of wedging the Wigan rail. The chair is to be cast in two parts, one of its sides, or cheeks, being separate from the other, and being removed to put in the rail; when so placed, the loose cheek is driven in, and the rail thereby confined; the patentee says, "I would have it understood that I am aware that railroad chairs have been made with a moveable jaw, and secured by means of wedges; I do not, therefore, claim that as my invention; but what I do claim as my invention, and desire to secure by letters patent, is the making of the moveable jaw with a dovetail to fit into a corresponding slide in the chair, and secured by a pin, as described."

FOR A BLOWING APPARATUS FOR FURNACES, &C.; *Frederick R. Dimpfel, city of New York, Dec.* 28.—The blowing wheel in this apparatus resembles that in ordinary use, but "between the wind wheel and the outer case, a space is left which may be denominated the air chamber. In this space, as also in and around the wheel generally, the air will become condensed by the rapid motion of the wheel, and not being able to escape in consequence of the closure between the collar and the outer case, as described, it may be made to exert a pressure of several pounds to the square inch, by regulating the escape opening."

The claims are to "the enclosing of the vanes of the wind wheel with circular sides or rims, between which and the outer case there is a space left, as described; and the attaching a collar to said sides or rims, to admit air to the revolving vanes, said collars being made to run air-tight, to prevent the escape of air from the air chamber. The whole being constructed and arranged in the manner set forth."

FOR AN IMPROVEMENT IN TANNING; *Lewis R. Palmer, Maryland, Otsego county, New York, Dec.* 31.—This improvement consists of "a machine for changing the hides from one vat to another, and expressing the exhausting liquor therefrom. The nature of the invention consists in a certain new and useful arrangement of loose rollers on an horizontal axle, placed above and parallel with a revolving cylinder, between which the hides are pressed, and by which the exhausted liquors are expressed therefrom, however uneven the surfaces of the hides may be, which cannot be effected by parallel cylinders of equal length."

The claim is to "the before described combination and arrangement of the parallel, loose, revolving rollers with the revolving cylinder placed below the same, between which the hides are drawn for pressing the exhausted liquors therefrom, in the process of tanning leather.

"The loose rollers are cylindrical rings arranged side by side on the upper horizontal shaft, the perforations in their centres being of such size as to allow them to play upon the shaft, and to bear, by their separate weights, upon the hide beneath them."

FOR AN IMPROVEMENT IN CONSTRUCTING CIRCULAR SAWS; *Menassah Andrews, Bridgewater, and James Sproat, Taunton, Massachusetts, Dec.* 31.—The object of this improvement is "to relieve the collar of a circular saw used for the purpose of sawing boards, shingles, and other articles, from the friction occasioned by the pressure of the article sawed, as it is separated from the block upon the collar of the saw." To effect this, a stationary curved plate is fixed to the frame of the machine, at the back of the saw, against which plate the stuff sawed is to

bear, as it is curved off from the saw, instead of bearing against the collar. The edge of this plate, nearest to the edge of the saw, is received behind a shoulder, or offset in the collar, thus insuring the end of the piece sawed, a passage on to the face of the plate.

The claim is to "the countersink in the collar, as described, and the insertion of the stationary plate, or reliever, as described, in such manner as to receive upon its edge the article sawed, as it is separated from the block."

FOR PROPELLING STEAM BOATS; *Benjamin D. Beecher, Prospect, New Haven county, Connecticut, Dec.* 31.—The mode of propelling described by the patentee, is intended, principally, for canal boats. "'The invention consists in constructing the bow, or fore part of the boat, so as to accommodate the screw or other propellers which I place there, which are intended, by their particular position, and mode of action, to draw the water directly from the bow, and to give it, as it passes towards the stern, such a direction as shall greatly diminish the resistance offered to the passage of the boat." The propelling is to be, in general, effected by means of two spiral or screw wheels, placed immediately in front, so as to extend completely out to the cutwater; and the claim is to "the manner of locating the two propellers in the bows of the boat, in combination with the manner in which I construct and extend the bottom of the boat forward, and thus causing the propellers to act upon the water in a direction inclined from each other, in the manner, and for the purpose, set forth."

LIST OF DESIGNS REGISTERED BETWEEN MAY 27TH AND JUNE 21ST.

Date of Registration. 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
May 27	704	J. Gough and Sons	Carpet	1 years.
31	705	R. Pettie	Signal lamp	3
"	706	S. Molyneux	Label	1
"	707,10	H., I., and J. Dixon	Carpet	1
"	711,12	C. and H. Talbot and Sons	Ditto	1
June 2	713	W. Elliott	Button	3
7	714	H. Woodward and Co.	Carpet	1
"	715	G. Barnett and R. Armfield	Button	3
9	716	J. Baynes	Pen	3
10	717	T. Home	Curtain pole	3
11	718	J. Chatwin	Button	3
14	719	Capt. T. Warrington	Sword	3
15	720	H. Davies	Governor	3
"	721,2	M'Michael and Grierson	Carpet	1
16	723	Southwell and Co.	Ditto	1
"	724	H., I., and J. Dixon	Ditto	1
17	725	Woodward, Gandell, and Co.	Ditto	1
18	726	Pardoe, Hoomans, and Co.	Ditto	1
"	727	J. Penner	Fender	3
"	728	Brown and Green	Stove	3
21	729	M'Michael and Grierson	Carpet	1
"	730	R. Bull	Shoe warmer	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH OF MAY AND THE 25TH OF JUNE, 1841.

George Bent Ollivant and Adam Howard, of Manchester, millwrights, for certain improvements in cylindrical printing machinery for printing calicoes and other fabrics, and in the apparatus connected therewith, which is also applicable to other useful purposes. June 5; six months.

John Mee, of Leicester, framesmith, for improvements in the manufacture of looped fabrics. June 5; six months.

William Hannis Taylor, of Lambeth, Esq., for certain improvements in propelling machinery. June 5; six months.

Joseph Gibbs, of the Oval, Kennington, civil engineer, for certain improvements in roads and railways, and in the means of propelling carriages thereon. June 5; six months.

Miles Berry, of Chancery-lane, patent agent, for certain improvements in machinery or apparatus for ruling paper. (A communication.) June 5; six months.

James Colley March, of Barnstaple, surgeon, for certain improved means of producing heat from the combustion of certain kinds of fuel. June 8; six months.

Henry Richardson Fanshaw, the younger, of Hatfield-street, Surrey, chemist, for improvements in curing hides and skins, and in tanning, washing, and cleaning hides, skins, and other matters. June 10; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery for propelling vessels on water, parts of which improvements apply also to steam-engines to be employed on land. June 10; six months.

Edward Hammond Bentall, of Heybridge, Essex, iron-founder, for certain improvements in ploughs. June 10; six months.

Robert Oram, of Salford, Lancaster, engineer, for certain improvements in hydraulic presses. June 12; six months.

James Wills Wayte, of the "Morning Advertiser" Office, Fleet-street, engineer, for certain improvements in machinery or apparatus for letter-press printing. June 12; six months.

John Anthony Tielens, of Fenchurch-street, merchant, for improvements in machinery or apparatus for knitting. (A communication.) June 12; six months.

George Claudius Ash, of Broad-street, Golden-square, dentist, for improvements in apparatus for fastening candles in candlesticks. June 12; six months.

Edward Palmer, of Newgate-street, gent., for improvements in producing printing surfaces, and in the printing china, pottery ware, music, maps, and portraits. June 12; six months.

Ezekiel Jones, of Stockport, mechanic, for certain improvements in machinery for preparing slubbing, roving, spinning, and doubling cotton, silk, wool, worsted, flax, and other fibrous substances. June 12; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gent., Peter Hunter Irvin, and Thomas Eugene Irvin, both of Charles-street, Hatton-garden, philosophical instrument makers, for an improved mode of producing light, and of manufacturing apparatus for the diffusion of light. June 17; six months.

Thomas Walker, of North Shields, engineer, for improvements in steam-engines. June 18; six months.

William Petrie, of Croydon, gent., for improvements in obtaining mechanical power, which are also applicable for obtaining rapid motion. June 19; six months.

John Haughton, of Liverpool, clerk, master of arts, for improvements in the method of affixing certain labels. June 19; six months.

James Henry Shaw, of Charlotte-street, Blackfriars, jeweller, for improvements in setting wheat and other seeds. June 19; six months.

Sir Samuel Brown, knight, of Netherbyers-house, Ayton, Berwick, for improvements in the means of drawing or moving carriages and other machines along inclined planes, railways, and other roads, and for drawing or propelling vessels in canals, rivers, and other navigable waters. June 19; six months.

John George Truscott Campbell, of Lambeth-hill, Upper Thames-street, grocer, for improvements in propelling vessels. June 19; six months.

Joseph Gaud, of North-crescent, Bedford-square, artist, and Alexander Bain, of Wigmore-street, Cavendish-square, mechanist, for improvements in inkstands and inkholders. June 21; six months.

Miles Berry, of Chancery-lane, patent agent, for a new or improved engine, machine, or apparatus for producing or obtaining motive power by means of gases or vapours produced by combustion. June 23; six months.

William Walker, the elder, of Standish-street, Liverpool, watch-finisher, for an improvement or improvements in the manufacture of the detached lever watch. June 23; six months.

George Thomas Day, of Upper Belgrave-place, Pimlico, gent., for an improved apparatus for creating draft applicable to chimneys and other purposes. June 23; six months.

John Henry Le Keux, of Southampton-street, Pentonville, for an improvement in line engraving, and in producing impressions therefrom. June 23; two months.

John Goodwin, of Cumberland-street, Hackney-road, piano-forte maker, for an improved construction of piano-fortes of certain descriptions. June 23; two months.

James Sidebottom, of Waterside, Derby, manufacturer, for certain improvements in machinery for apparatus. June 23.

William Chesterman, of Burford, Oxford, gentleman, for improvements in filtering liquids. June 23; six months.

Robert Stephenson, of Great George-street, Westminster, civil engineer, for certain improvements in the arrangement and combination of the parts of steam engines of the sort commonly called locomotive engines. June 23; six months.

John Lee Stevens, of King Edward-street, Southwark, general agent, and John King, of College Hill, London, printer, for certain improvements in candle-sticks and other candle holders. June 25; six months.

NOTES AND NOTICES.

Spontaneous Combustion.—About two o'clock, on Sunday morning, the servant of Mr. Glass, of Upton, was awoke by a loud noise made by a horse in a stable close to the house, and on looking out of the window she discovered that the stable was on fire. She immediately called her master, and on their going into the stable, which was locked, they discovered that the fire originated from a large canvass, used for covering ricks, which had on the previous day been partly covered with two gallons of oil to render it impervious to the rain, and which, being put down in the stable in a heap, in a moist state, generated a sufficient quantity of heat to set it on fire. By this timely discovery of the fire, and a supply of water being at hand, the loss was confined to the canvass, a chaff-box, some harness, and a little damage done to the roof.—*Bath Journal.*

Worms in Flower-pots may be easily destroyed by watering the soil with lime water, which may be made by putting a piece of lime weighing about two pounds into a pailful of water; when the whole is slacked and stirred up, it should be poured off, and the soil in the pot should be liberally watered with it. The worms will soon leave the premises by crawling upon the surface, when they may be taken off and destroyed.

Noble Firemen.—Lord Melbourne, accompanied by the Earl of Albemarle, exerted himself in a praiseworthy manner on the night of a recent fire at Windsor. Mr. Whitman, the clerk of the works, was attempting to get out the engine from the engine-house at the Castle, but had not sufficient strength, unaided, for that purpose, and the whole of the workmen had left for the evening. The Noble Premier and the Master of the Horse assisted "like good ones" in getting out the engine, and in pushing it down the hill from the Castle into the heart of the neighbourhood.

Fatality of Theatres.—Drury-lane was built in 1662, destroyed by fire in 1672, rebuilt in 1674, and burned down three years after. It was again burned down in 1809. Covent-garden Theatre was built in 1733, and destroyed by fire in 1808. Her Majesty's Theatre opened in 1704, burned down in 1789. Pantheon, Oxford-street, built in 1772, burned down in 1781, and eight years after was again destroyed by fire. Surrey Theatre destroyed in 1805. Royalty Theatre burned down in 1819. English Opera-house destroyed by fire on the 17th February, 1830. Astley's Amphitheatre destroyed 8th June, 1841.

British Museum.—The number of visitors to the British Museum on Whit-Monday was 9,031, being 3,177 less than on Whit-Monday last year. On Tuesday there were 1,986 visitors, and Wednesday 2,636. The Museum is now open until 7 o'clock in the evening.

Hammer-cloths.—The hammer-cloth is an ornamental covering for a coach-box. The coachman formerly used to carry a hammer, pincers, a few nails, &c., in a leather pouch hanging to his box, and this cloth was devised for the hiding or concealing them from public view—hence the name.

END OF THE THIRTY-FOURTH VOLUME.

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